# HEALTH ESSENTIALS

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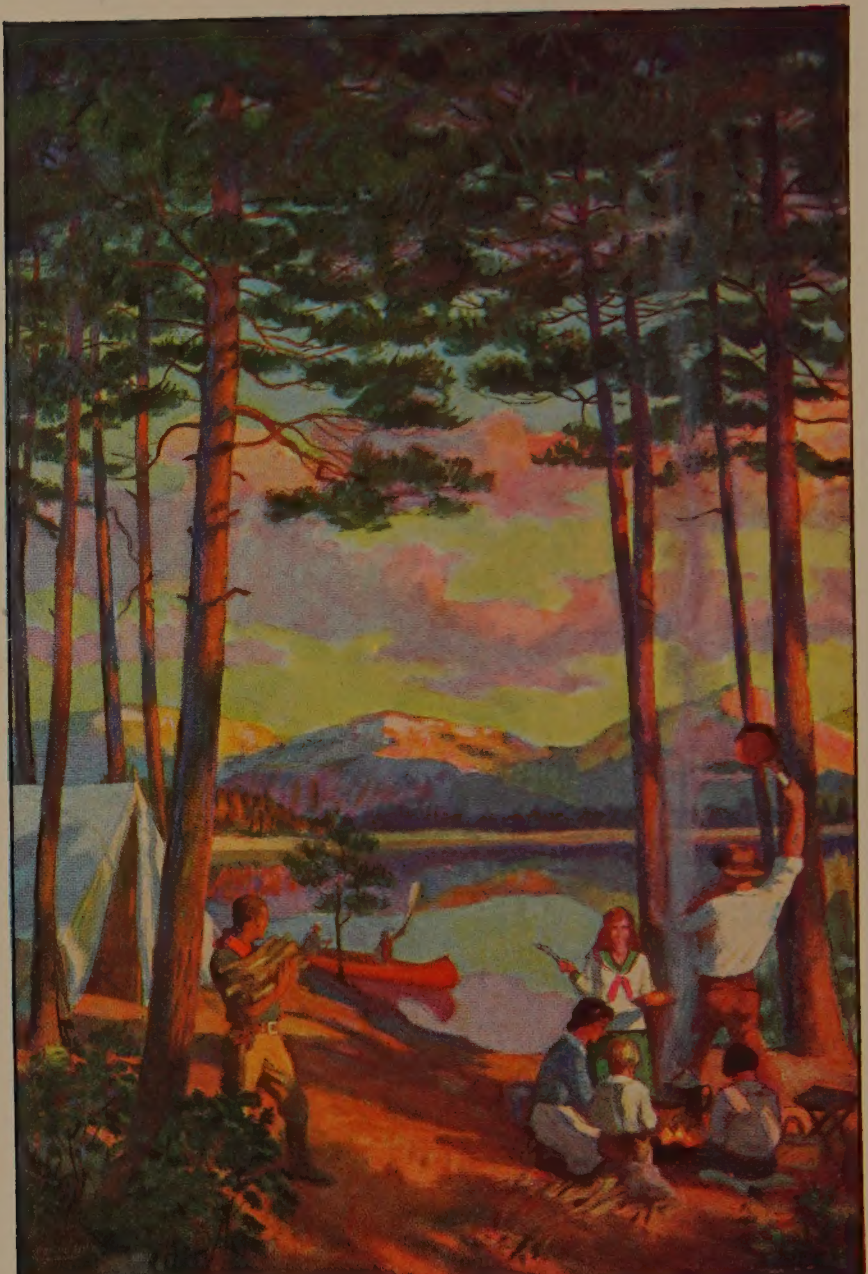

THE JOY OF LIVING

# HEALTH ESSENTIALS

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GINN AND COMPANY

BOSTON · NEW YORK · CHICAGO · LONDON
ATLANTA · DALLAS · COLUMBUS · SAN FRANCISCO

PRINTED IN THE UNITED STATES OF AMERICA

529.8

*For the lower grades*

*The* SUNSHINE SCHOOL *(Andress and Bragg)*

*A* JOURNEY TO HEALTH LAND *(Andress)*

*The* BOYS AND GIRLS OF WAKE-UP TOWN *(Andress)*

*For the upper grades*

HEALTH AND SUCCESS *(Andress and Evans)*

HEALTH AND GOOD CITIZENSHIP *(Andress and Evans)*

*For high school*

HEALTH ESSENTIALS *(Andress, Aldinger, and Goldberger)*

The Athenæum Press
GINN AND COMPANY · PROPRIETORS · BOSTON · U.S.A.

# PREFACE

The future leaders of society are to be found today in our high schools. They will largely shape public opinion and determine the progress of the nation. The increasing popularity of the high school and its broad appeal make this inevitable. A small percentage of those now in high school will go on to higher institutions of learning, but a large majority of them will finish their formal education before or at graduation. A consideration of these facts has determined in large measure the content of "Health Essentials."

The primary objective is the present health of the high-school student, or *personal hygiene.* The period of adolescence is a critical period both physically and mentally, and the strain of the modern high school is very great. Throughout the text the authors have tried to visualize the health problems of the student and both in the text and in the exercises to present information and a stimulus for the formation of habits which will be of real worth.

Worthy home membership as an objective in education includes health as one of its aims. Not only is the high-school student now a member of the home but he is destined soon to share in guiding the destinies of his own home. *Home hygiene* thus becomes the second objective. Unlike some of the health texts designed for high schools, this book not only considers the general hygiene and sanitation of the home but stresses the health of children. This has present value, since many of the girls are called upon to help in taking care of their younger brothers and sisters. Not a few will be married before many years, therefore such information should have positive

value for the future. If they do not get an introduction to child hygiene now they will be handicapped as parents.

*Community hygiene* is a third factor of significance. The high-school student while in school has some opportunity to influence the health of the community, and what the community is to be in the future will depend largely on his understanding, initiative, and participation in solving community health problems. As a voter and citizen he should be informed on, and concerned with, such problems as the milk and water supply.

The great mass of high-school students are facing the serious matter of choosing their life work. For this reason *industrial hygiene* as a health problem is presented so that the pupil may know about the health advantages and hazards of different occupations.

An effort has been made to preserve a reasonable balance between the hygiene which the student needs now and what he ought to know in the future in order to become a happy and efficient citizen.

Physiology and anatomy are not presented as being worth while in themselves but are introduced into the text so as to give students a clearer understanding of the basis of modern hygiene.

Hygiene is not merely an informational subject. Its value depends on proper behavior. For this reason every opportunity is offered, through the exercises "For Informal Discussion in Class and at Home" at the end of each chapter, to carry out the suggestions offered in the text. Not only is hygiene to be measured by behavior but it is best learned through doing. Therefore at the end of the chapters there is an opportunity to observe, investigate, and experiment in matters referred to in the body of the text.

The authors have exercised great care in choosing chapter headings that are unconventional and likely to prove inviting to high-school students. For example, the chapter on pos-

ture is entitled "Be Upright," and the one on child hygiene, "Healthy, Happy Childhood." All captions are intended to be positive in character and whenever convenient to suggest action in meeting a situation, as, for example, "Confide in a good friend when you are in trouble."

Throughout the text the idea presented to the pupil is that health is not merely worth while in itself but is a stepping stone toward the realization of all the worthy ambitions of life, particularly those that appeal to adolescents. Observation and psychological study indicate that one of the major interests of adolescence is in attracting the opposite sex. This means an interest in a good personal appearance. That health makes for good looks, attractiveness, and school and social success is an idea that runs through the book. Posture, dental hygiene, and the care of the skin and hair are good examples of topics that center around such themes.

The authors have also tried to write a book with human interest. Dramatic incidents, heroic achievements, and stories from real life are brought in not only because they are interesting but also to encourage healthful living.

Instruction in hygiene should be healthful. The problem of disease is met according to best authorities, but with no intention of playing up the gruesome or of exciting fear. Much emphasis is laid on our ability to prevent and conquer disease. It is one of the purposes of this book to develop not hypochondriacs but buoyant, hopeful, healthy personalities.

The authors wish to acknowledge their indebtedness to the course of study in health of the New York Public High Schools. An intimate contact of two of the authors with the health teaching of these schools has been of inestimable value.

# CONTENTS


| CHAPTER | | PAGE |
|---|---|---|
| I. | Getting the Most out of Life | 1 |
| II. | The River of Life | 15 |
| III. | The Breath of Life | 37 |
| IV. | The Air we Live in | 50 |
| V. | The Power of Self-control | 62 |
| VI. | A Healthy Mind | 74 |
| VII. | A Healthy Mouth is Good Health Insurance | 86 |
| VIII. | Changing Food to Tissue, Play, and Work | 104 |
| IX. | Eating to live Healthfully | 113 |
| X. | Startling Discoveries in Physical and Mental Development | 152 |
| XI. | Fun in Play, Work, and Rest | 161 |
| XII. | Be Upright | 177 |
| XIII. | On Your Feet | 193 |
| XIV. | Let us See | 203 |
| XV. | Can you Hear me? | 221 |
| XVI. | Having a Real Vacation | 231 |
| XVII. | Health and Attractiveness | 238 |
| XVIII. | Dress for Health, Comfort, and Beauty | 252 |
| XIX. | Alcohol, Tobacco, and Drug Habits as Liabilities | 262 |
| XX. | The Conquest of Disease | 286 |
| XXI. | When Illness Comes | 317 |
| XXII. | Work for Safety and be Prepared for Emergencies | 333 |
| XXIII. | Healthy, Happy Childhood | 356 |
| XXIV. | Health in the Home | 380 |

| CHAPTER | | PAGE |
|---|---|---|
| XXV. | Safeguarding the Public's Health | 394 |
| XXVI. | A Healthful Water Supply | 411 |
| XXVII. | A Healthful Milk Supply | 430 |
| XXVIII. | The Choice of a Healthful Occupation | 442 |
| XXIX. | Periodic Health Examinations | 460 |
| APPENDIX | | 469 |
| INDEX | | 475 |

# GOOD HEALTH

Health is the indispensable foundation for the satisfaction of life. Everything of domestic joy or occupational success has to be built on bodily wholesomeness and vitality.

Health is essential to the enjoyment all through life of sports and active bodily exercise. It is also necessary to continuous capacity for hard work; and it is only through active play and hard work that anybody can make sure of the durable satisfactions of life.

To promote health in the individual, the family, and the community should be the constant aim of every good citizen in the American democracy.

CHARLES W. ELIOT

President of Harvard University,
1869–1909

# HEALTH ESSENTIALS

## CHAPTER I

### GETTING THE MOST OUT OF LIFE

**1. Roosevelt's enjoyment of life.** All those who came in contact with the remarkable personality of Theodore Roosevelt comment on his keen enjoyment of life. It reflected color and enthusiasm. The hours did not seem to have for him a dull moment. He enjoyed his food, his sleep, his work, and his play. Whether it was as a cowboy on the Western plains, a student in college, an author, explorer, hunter, or biologist, a youthful politician fighting a corrupt political machine, a commanding officer on the field of battle, or a president of the United States, the events of the day were entered into with zest. Out of such a rich life he could well say: "It is good to live, to be able of limb and strong of heart; to have great battles to fight and a chance to win. It is good to test our strength: To know the things worth while: To joy in the splendor of victory."

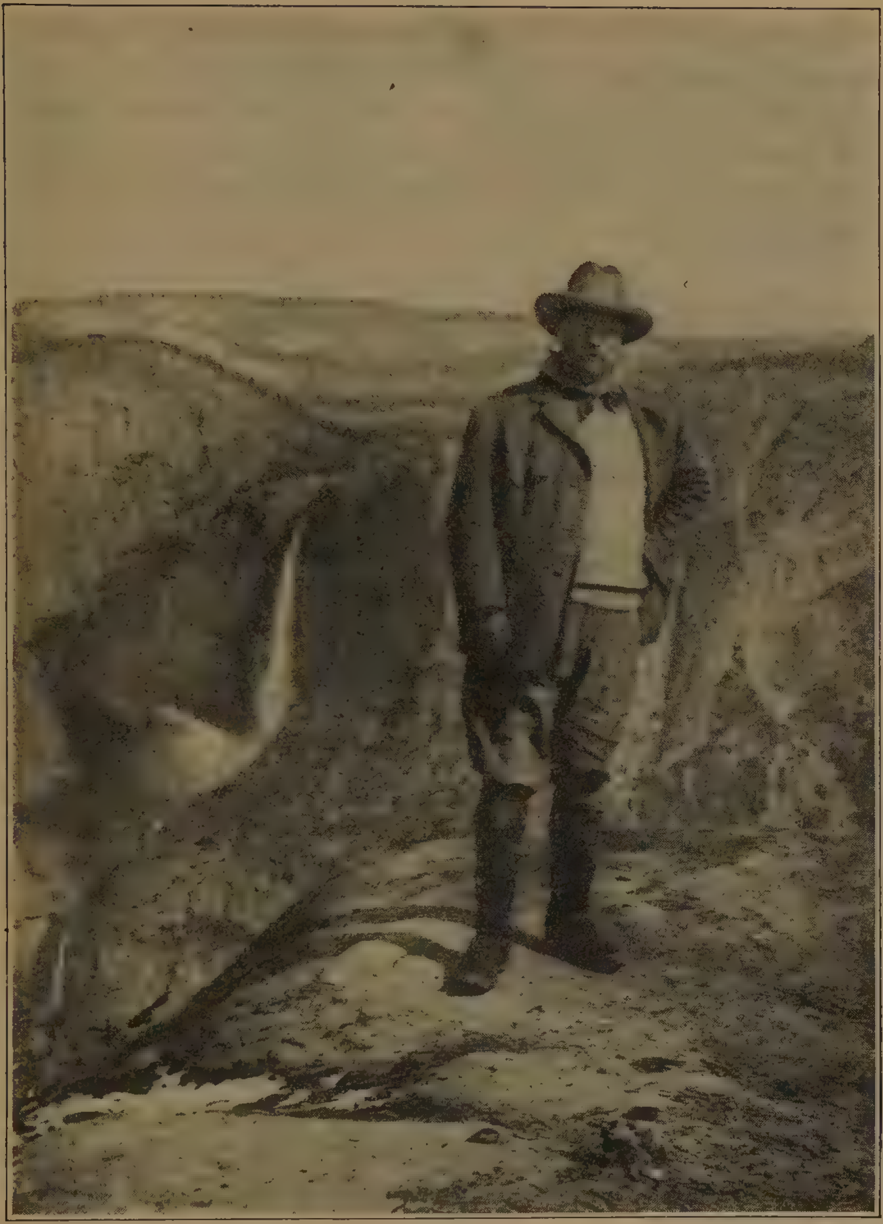
**2. Health, a foundation of happiness.** One reason why Roosevelt was able to get so much out of life was because of his excellent physical health. His body under the guidance of his eager mind led to success and keen satisfaction in living. Although some people have achieved a certain amount of success in life even with serious physical handicaps, this is rare. They accomplished what they did in spite of ill health. We can imagine how much more they might have done for

themselves and for the world if they had been healthy. All of us can easily recall the names of scores of people who failed and brought disaster and misery upon themselves, their families and their business through ill health. To be ill or in poor health usually means that one's desires and needs cannot be satisfied. Health is better than lands and money, because such things cannot be enjoyed without good health. It is also superior to fame and high position, because these too mean little without the health with which to enjoy them. The old bit of philosophy is true that "a hale cobbler is better than a sick king." Ralph Waldo Emerson in a similar vein wrote, "Give me health and a day and I will make the pomp of emperors ridiculous."

Dr. Allan J. McLaughlin, surgeon of the United States Public Health Service, says of health and happiness:

> The best part of health is the happiness it brings. There is nothing equal to radiant good health to give joy to life. A person who is in good health feels as if he owned the world and that it is a mighty good place to live in. We all know the feeling of exhilaration when we have been out tramping in brisk air and have accomplished some object which we set out to do. There is a zest and pleasure which is unusual. Life seems more worth living and the little irritations which sometimes occur are forgotten. When one is really healthy, there is a perpetual feeling like that. Life is joy, and joy is omnipresent in life. To be able to say truthfully, "Yes, I feel fine today," is one of the most satisfying assets anyone can have. Yes; there is real joy, comfort, and happiness in perfect health.

**3. Roosevelt winning good health.** As a boy Roosevelt was frail and weak. It seemed doubtful whether he would ever grow up to be a strong, robust man. His father was much concerned about him and therefore he converted a room on the second story of his house into a kind of open-air gymnasium with swings and bars and seesaws. Then one day when his son was about eleven years old he called him and said: "Theodore, you have the mind, but you have not the body, and without



Underwood & Underwood

FIG. 1. Theodore Roosevelt found mountain-climbing exhilarating

He also climbed other heights requiring courage and endurance. Good health helped him to be successful

the help of the body the mind cannot go as far as it should. You must *make* your body. It is hard drudgery to make one's body, but I know you will do it." The little boy looked up and, with flashing eye, said, "*I'll make my body.*"

His sister, Corinne Roosevelt Robinson, in writing about this incident says:

> That was his first important promise to himself, and the delicate little boy began his work; and for many years one of my most vivid recollections is seeing him between horizontal bars, widening his chest by regular, monotonous motion — drudgery indeed — but a drudgery which eventuated in his being not only the apostle but the exponent of the strenuous life.

From the day that Theodore Roosevelt started to make his body better he never ceased in that effort until the end of his life. He cultivated the out-of-door life and took delight in hiking, horseback riding, swimming, tennis, ball, wrestling, running, jumping, and rowing. As a part of the program of winning health he became a cowboy in the West. There he became expert in riding a horse and in shooting game. It was by such courageous effort that he became strong enough to work and play with so much vigor and endurance. During his varied career there were many examples of this capacity for endurance. One of the most interesting of these occurred while he was president of the United States. The information came to him that many of the officers in service were so negligent of their physical welfare that they were unfit for military service. He therefore issued an order that every officer should prove his ability to walk fifty miles or ride one hundred in three days. This was resented by the press as a bit of capricious tyranny. Some of the elderly officers intrigued with their friends in Congress to have the order annulled. To show the reasonableness of this order Roosevelt himself rode over a hundred miles in one day over roads frozen and in ruts.

During the day there was a storm of snow and sleet. After this all open objection ceased.

The life of Roosevelt should be an inspiration to the youth of America. It shows that health may be won.

**4. Meaning of health.** Health is usually looked upon as something entirely physical. Most people think of health as mere freedom from disease and physical defects. To them health exists when there is no disease like typhoid fever, tuberculosis, or measles, and no defect like adenoids, decayed teeth, or curvature of the spine. It is true that freedom from such conditions is desirable for the best of health, but one may have a body with no appreciable blemish and yet lack health. Good health demands that physical life be maintained at its maximum vigor. The ideal is robust health. One should not only have energy enough to keep out of a sick bed and attend to his business, but a reserve to prosecute his business with vigor and enthusiasm and indulge in play and recreation. It was this abounding physical life which expressed itself so vividly in Roosevelt's life. From the Elkhorn Ranch in 1886 he wrote to his sister: "Have been in the saddle all day, and have worked like a beaver, and am as rugged and happy as possible. . . . I wish I could see all of you, but I certainly do enjoy life."

An exuberance of physical energy usually results in contentment, satisfaction, and happiness. Unfortunately this is not always so. A good physical body may not function correctly in life any more than a good watch which may be perfect in every part but not well adjusted. Health is mental as well as physical. Good health means not only freedom from abnormal conditions like disease and physical defects but also lack of worry, the satisfactions of success, and a feeling that life is genuinely worth while. In other words, to be healthy means that one is getting out of life the best and most that is possible. He is living as usefully and happily as he can.

**5. Good health possible for nearly everybody.** Nearly everybody can have good health if he is willing to try to reach the goal. Of course, there are some exceptions. Some persons have a bad heredity. They were born with weak bodies. Some are so frail or physically defective that they cannot expect to win robust health, but those cases are so rare that they may be

FIG. 2. Playing tennis is one of the best games for the out of doors

practically disregarded. Most people, like Roosevelt, could win health if they only knew how and tried.

Probably the majority of us have such good health that our chief problem is to preserve it, but nearly all of us could find ways of improving our health. In most cases this is as easy as becoming proficient in science, Latin, or mathematics. Two things are necessary: first, a desire to be healthy; secondly, the determination to undergo training in order to win health.

**6. Removal of physical defects.** As you start this year's work in the art of learning to conserve and improve your own

health it would be well to have the advice of a physician. Probably your school gives you a physical examination every year. If the school does this and you find that you have certain physical defects, like decayed teeth, diseased tonsils, poor sight, or defective hearing, then you should seek expert advice. No matter how well one may observe the rules of health, the handicap of a defect like diseased tonsils will often seriously interfere with one's work and happiness. If you do not get a regular physical examination through a school physician, it would be well to consult your family physician.

Ordinarily people consult a physician only when they are ill — too ill to attend to their affairs. How much better it would be to keep in such good condition that illness would be prevented. The human body is a delicate machine. Like any machine it gets out of order. The owner of a bicycle or an automobile does not wait until his machine refuses to do any more work before he consults the skilled mechanic. At intervals he has the skilled mechanic look his machine over thoroughly so that it may offer him the greatest amount of service. Most people are not as farseeing about their bodies as they are about their automobiles. If they were, much illness and loss of time from school and work would be prevented.

**7. Importance of health habits.** It is desirable to know a good deal about health, but knowledge alone will have no effect on our health. It is the right kind of action that counts. For example, there is much to know about foods; but the important thing for health is eating the right kind of food.

Good health also requires regularity of action. It will not suffice simply to eat the proper kind of food today and then violate every health rule pertaining to food tomorrow. We need to carry out the health rules every day in a somewhat mechanical fashion. When we do this we have formed habits.

When habits are formed they tend to become unconscious. The way we stand, tie our neckties, sign our names, or put on

our shoes finally gets to be a matter of habit. It is well that this is so, because it is no longer necessary for us to think about those acts. Our attention is left free to learn other things.

The person who is well trained in health also does not find it necessary to be thinking all the time about his health. This would make life unbearable. He has trained himself to do automatically those things that promote his own health. He has formed good health habits.

**8. How to form health habits.** Professor William James has given three excellent rules for habit formation. By following them with care we can form almost any habit.

The first maxim is "We must take care to *launch ourselves with as strong and decided an initiative as possible.*" This means that we should start not only with great enthusiasm and will power, but that we should make conditions such that they will encourage the forming of the new habit. If you became dissatisfied with your standing posture, it would be desirable, for example, not only to decide to improve it but also to announce this to the members of your family and ask them to remind you each time you lapsed in your habit.

The second maxim is "*Never suffer an exception to occur till the new habit is securely rooted in your life.*" Each lapse is like the letting fall of a ball of string which one is carefully winding up: a single slip undoes more than a good many turns will wind again. It is not advisable to form a new habit by gradually breaking away from the old one. It is better to break off sharply. If one practices conscientiously, without exceptions, the habit is on the way to be formed. Every exception weakens the growth of habit. If we decide to take a little nap in the morning after the alarm rings, it will be harder to arise promptly the next morning. If we continue to be negligent, soon we shall not even hear the alarm. But if we face some real difficulty, something really hard, such as declining an attractive invitation to a party in the evening

Ewing Galloway

FIG. 3. The West Point military cadets at drill

This group represents the flower of American youth. Each one reaches West Point in almost perfect physical condition. Training in good habits gives them a correct figure and keeps them in excellent health

because we need the time for sleep and for our studies, we shall find it easier to do the next time. Finally, we shall be able to decline an invitation under such conditions with comparative ease because acceptance is no longer a temptation.

The third maxim is "*Seize the very first opportunity to act on every resolution you make.*" After you have made a resolution do not wait to act upon it. Act as soon as the opportunity

Keystone View Co.

FIG. 4. Winning health through active play

offers itself. To learn to speak French one should try to talk with every Frenchman with whom he comes in contact. In this way one will gradually get command of the language. In a like manner one may learn to eat salad by eating some at every opportunity.

It is by the practice of such rules that one fashions his character as he wills.

Roosevelt found it necessary to give himself a thorough training in forming good habits. By so doing he almost made himself over.

In his "Autobiography" he says:

> I never won anything without hard labor and the exercise of my best judgment and careful planning and working long in advance. Having been a rather sickly and awkward boy, I was as a young man at first both nervous and distrustful of my own prowess. I had to train myself painfully and laboriously not merely as regards my body but as regards my soul and spirit.

Having read in one of Marryat's books that the way to become fearless was to act as if he were not frightened, he resolved to try it. He found that by sheer dint of practicing fearlessness when he did not feel it the pretense passed over into reality. He ceased to be afraid.

In giving advice on how to learn fearlessness he said, "Let him dream about being a fearless man, and the more he dreams the better he will be, always provided he does his best to realize the dream in practice."

Roosevelt proved what everybody may prove if he will, that body and mind to some extent may be made over by the practice of habits. In the words of Henley, to which each of us may in part at least subscribe,

> I am the master of my fate,
> I am the captain of my soul.

**9. A score sheet as a help in forming good health habits.** One of the difficulties in forming health habits is to remember to practice them. For that reason it is desirable to check up systematically every day until the habits are formed. The score sheet suggested on pages 12 and 13 is one used in the New York City high schools. As you continue to study this book you will learn the various reasons why these habits seem desirable. Check up your habits now. In how many of them do you have a perfect score? Where your habits are not perfect give a corresponding score. Work for improvement.

HEALTH-HABIT SCORE SHEET FOR HIGH-SCHOOL STUDENTS

| | CREDITS | DATES |
|---|---|---|
| A. *Posture* | | |
| 1. Small pillow used when sleeping . . . . . . | 1 | |
| 2. Stand tall. Sit erect with head up and chest high . . . . . . . . . . . . . . . . . . . . | 4 | |
| 3. Books carried at arm's length, extended downward, and changed from one hand to the other | 1 | |
| 4. Shoes for school which do not cramp the toes and without high heels . . . . . . . . . . | 2 | |
| B. *Food* | | |
| 5. Thorough chewing (mastication) . . . . . . | 3 | |
| 6. Some raw food or fruit eaten daily . . . . . | 2 | |
| 7. Some fresh green vegetables eaten daily in addition to other foods . . . . . . . . . . . . | 2 | |
| 8. One pint (at least) of milk, consumed daily . . | 2 | |
| 9. No candy between meals . . . . . . . . . . | 2 | |
| 10. No coffee . . . . . . . . . . . . . . . . . | 2 | |
| 11. One glass of water upon rising . . . . . . . | 2 | |
| 12. Four (at least) additional glasses of water during the day . . . . . . . . . . . . . . . | 2 | |
| C. *Exercise* | | |
| 13. Brief setting-up exercises before dressing and before retiring . . . . . . . . . . . . . . | 2 | |
| 14. No violent exercise immediately after eating . | 2 | |
| 15. One half hour (at least) each day of enjoyable recreation out of doors . . . . . . . . . . | 5 | |
| D. *Cleanliness* | | |
| 16. Soap and water used daily for bodily cleanliness | 4 | |
| 17. Hot bath at least once a week . . . . . . . | 2 | |
| 18. Individual towel . . . . . . . . . . . . . . | 2 | |
| 19. Hands and face washed before breakfast and dinner (also before lunch when possible) . . | 2 | |
| 20. Teeth brushed at least twice a day . . . . . | 5 | |
| 21. Dental floss used at least once a week . . . . | 1 | |
| 22. Finger nails cleaned daily, and not bitten . . | 2 | |
| 23. Hair and scalp clean. Shampoo every two weeks . . . . . . . . . . . . . . . . . . . . | 2 | |
| E. *Home environment* | | |
| 24. Room temperature not over 70 degrees during months when controllable. Thermometer consulted . . . . . . . . . . . | 2 | |

| | | |
|---|---|---|
| 25. Bedroom windows opened at night (screened in summer) | 4 | |
| 26. Steady and sufficient light when studying or reading and avoidance of glare | 2 | |
| 27. Quiet room for study | 2 | |
| F. *Relaxation and rest* | | |
| 28. At least eight hours' sleep | 3 | |
| 29. Prevention of fatigue, when studying, by short rest periods | 1 | |
| 30. Music (radio, piano, etc.) or games for recreation in the home | 2 | |
| 31. Avoidance in general of movies and parties during the school week | 4 | |
| G. *Regularity* | | |
| 32. Regular toilet habits | 5 | |
| 33. Rising in time to attend to all necessary details and breakfast without excessive hurry | 2 | |
| 34. Meals at regular times | 1 | |
| 35. Home study at regular times and in general not after 10 P.M. | 2 | |
| 36. Concentration of mind on work when studying | 2 | |
| 37. Attitude of punctuality to all engagements | 1 | |
| H. *Coöperation* | | |
| 38. Annual health examination or medical attention to remediable defects, such as poor vision, flat feet, adenoids, etc. | 7 | |
| 39. Dental examination: cleaning and correction of defects at least every school term | 4 | |
| 40. No smoking | 2 | |
| | 100 | |

## *For Informal Discussion in Class and at Home*

1. Read Roosevelt's "Autobiography." Select passages that show his great enjoyment of life.

2. Write a theme defending the proposition that "Good Health is Possible for Nearly Everybody."

3. Discuss each of James's rules for habit formation in connection with the forming of some health habit.

4. Defend the proposition that everybody should have a health examination annually.

5. Find out facts not mentioned in this chapter showing how Roosevelt, Franklin, Washington, and Lincoln formed habits.

6. Read all of Henley's poem "Excelsis." Do you or do you not believe it? To what extent is it true of manners? of morals? of health?

7. In what way do you need to make yourself over mentally and physically? Write a contract with yourself which will read something like this:

I, James Smith, on the eighteenth day of October, 1927, do hereby agree to train myself (mention the habits to be formed).

Signed ________________

Put this contract up in some conspicuous place. Check yourself on the habits each day. Are you gaining every day and week? Are you a good soldier? Have you the courage like Roosevelt to press on to victory?

## CHAPTER II

### THE RIVER OF LIFE

**10. The vital fluid.** Everybody is much concerned when there is violent bleeding. A severe cut or the flowing of blood from the mouth or nose is a matter of deep concern, for we know that the blood is the vital fluid. It comprises about 7 per cent of the bodily weight. Without blood man cannot live. A healthy adult has about a gallon and a half of blood. The loss of a certain amount of it brings weakness and, if continued, unconsciousness, and finally death results. Although everybody realizes that the blood is necessary for life, few people understand just what work the blood does and how it performs its task. This is one of the most interesting stories in physiology and health.

**11. Life in the cells.** Although the blood is so important to life, the real life of the body depends upon the healthful activity of the cells, which are nourished by the blood. This knowledge comes to us through the wonders of the compound microscope. From your study of biology you may know that there are forms of life so tiny that they cannot be seen with the unaided eye. An amœba found in stagnant water is of this type. It is composed of a tiny bit of jellylike matter and is known as a single-celled organism. It has no ears, eyes, organs of digestion, sense organs, nerves, or muscles, yet it is sensitive to its surroundings, breathes, digests, and performs all the functions necessary for life. It takes its food from the liquid surrounding it and throws off its waste products into the same liquid. Strange to say, the human body is largely composed of living cells, but these cells are not independent

of each other. They are all working together like a community. If they all perform their individual work and coöperate with each other, the body may be said to be in a state of health.

Not only the human body but the body of every living plant and animal is made up of cells. They are called cells because under the microscope they appear like the cells, or chambers, found in a honeycomb. There are many kinds of cells, but they are all very much alike in having a cell wall containing a rather clear, colorless, jelly-like material known as protoplasm. This protoplasm is the really living part of a plant or animal. There is no other living thing in the world except protoplasm. If we carefully examine the protoplasm we find that it is never a perfectly clear jelly. Under the microscope solid bodies can often be seen floating around within the wall. Near the center we can usually find a portion that seems denser than the rest. This is called the nucleus and is essential to the life of the cell. Live protoplasm is always moving about within the cell. This movement is easily seen in the cells of certain water plants.

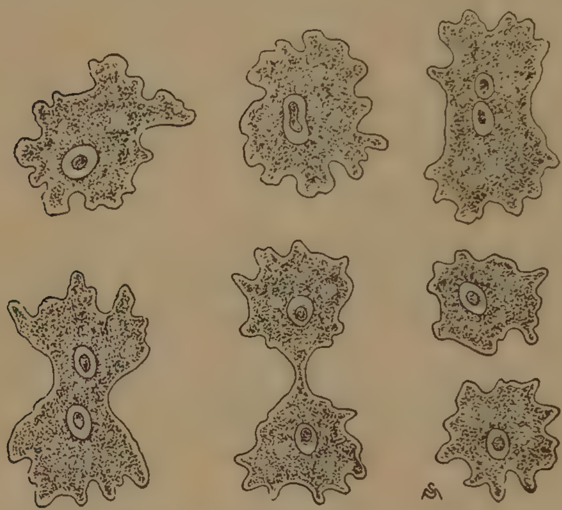


FIG. 5. How an amœba becomes two amœbæ

When this tiny microscopic animal becomes full grown it gradually divides, as shown above, until there are two individuals. Each of the new cells has a nucleus and the same kind of structure as the parent cell, except that at first it will be smaller. The cells of the human body also grow by cell division

To summarize: the cell assimilates, it is continually building itself up and replenishing its store of energy, and it is con-

tinually breaking down into simpler products with a setting free of energy. It grows; it moves; it reproduces itself. In other words, it is alive and is the basis of all life.

**12. How cells grow.** Any organism like the human body has the power to grow and to repair lost or injured parts to a certain extent. If you cut your finger, it is said to heal. Among the processes at work is that of cell division. Cells divide so that where there was but one there are now two; and these again divide and increase to four, then eight, and so on. In this way some kinds of lost tissue may be restored.

**13. Different kinds of cells and tissues.** In one-celled forms of life, like the amœba, yeast cells, and bacteria, one cell performs all the various kinds of work

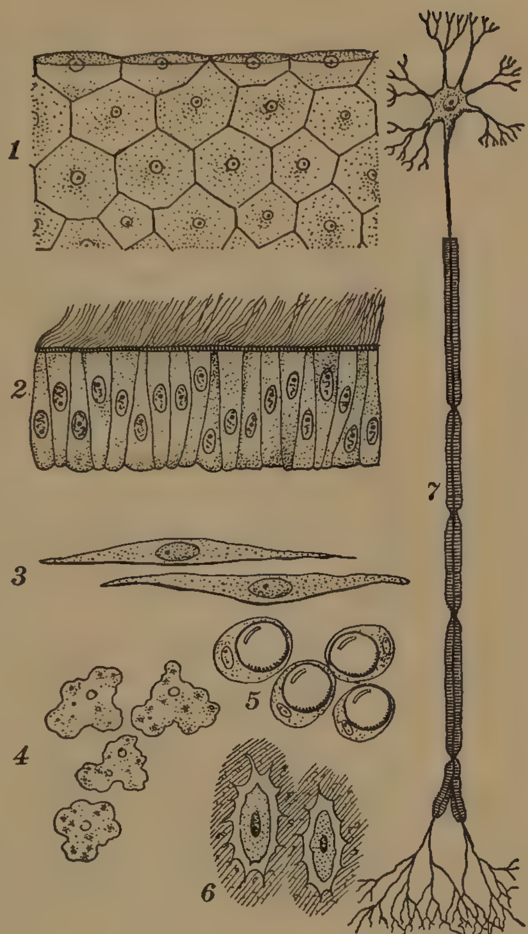



FIG. 6. Different kinds of cells found in the human body

Each kind has a special duty to perform and is worthless for any other service. *1*, flat epithelial cells, like those lining the cavity of the abdomen in man and other animals; *2*, columnar epithelial cells, like those lining the air passages, with hairlike projections of protoplasm, called *cilia*; *3*, muscle cells, unstriped, like those in the walls of the intestine and of blood vessels; *4*, shapeless cells of naked protoplasm, like those of amœbæ or of white blood corpuscles; *5*, cells containing fat globules like those in adipose tissue; *6*, bone cells surrounded by hard deposits of limy material; *7*, a nerve cell, or *neurone*

required by the organism; but in a multicellular organism like the human body there are many different kinds of cells, each kind being specialized in its work. Cells may be considered very much like the building material in a house. Masses of similar cells, like the muscle cells, are called a tissue.

There are four different kinds or classes of tissue; namely, epithelial, connective, muscular, and nervous. The *epithelial* tissue consists of cells packed very loosely together and united by a kind of cement substance in appearance like the white of an egg. The epithelial tissue covers the surface of the body and lines every cavity and tube of the body. One division of these cells is protective, such as the skin and lining of the mouth; the other division is composed of cells that have highly active protoplasm. Such cells form secretions from the food brought to them by the blood. Among these cells are those of the salivary glands, that manufacture the saliva, and the gastric glands, that manufacture the gastric juice.

In between the various groups of cells of the body, holding and binding them together, is a passive tissue called *connective* tissue. Without this kind of material the cells of the body would all fall apart. It is useful in much the same way that cement is useful in holding the bricks together in a wall. Some of this tissue is white and fibrous and is the kind found in various organs of the body. The yellow, elastic tissue composes cords and tendons. Fat, which is stored away in globules in the white connective tissue, is called the adipose tissue. It serves as cushions for organs like the eye and serves as a food reserve for living cells. Cartilage is an elastic tissue useful in packing the joints and giving form and protection to the body in places where bones would not be desirable; for example, the ears and the end of the nose are made of cartilage. Perhaps you can tell why cartilage would be better at those points than bone material. The skeleton, or bony framework, of the body is composed of bones. They support the complete

organs and hold them in their right places. Although most of the so-called connective tissues are made up of bone material, it should be remembered that they are produced by living cells. Thus, within the living bone are cells which manufacture bone. Without them bones could not grow or mend themselves after they were broken.

The *muscular* tissue enables the different parts of the body to move. There are two different kinds of muscle cells. Those muscles that are made of striped cells are called the voluntary muscles, because they are usually under the control of the will. The striped muscles are connected with the skeleton. The muscles made of unstriped, or smooth, cells are often called involuntary because they are not usually subject to conscious control. The involuntary muscles are found in the internal organs. The contraction of the walls of the stomach, for example, is due to the work of the involuntary muscles. All muscular tissue has the power to contract, or grow shorter, and to relax, or grow longer, but this is usually dependent upon the stimulation of the nervous system.

The *nervous* tissue is associated with the muscular tissue, since the muscles move only when they are stimulated by nerve cells. These cells compose the brain, spinal cord, and nerves. These nerve cells have a cell body and collaterals, or branches. Some of these microscopic cells have branches two or three feet long. The glistening white cords, or nerves, are made up of fibers of nerve cells. Many of the nerves end in sense organs and carry their messages to some central point like the spinal cord or brain, where the messages are relayed to glands or muscles.

Different kinds of tissue make up organs like the lungs or heart. A combination of organs coöperating in doing a certain kind of work, like the organs of digestion, is called a system. We have the muscular, nervous, respiratory, circulatory, and digestive systems.

**14. Living cells surrounded by lymph.** You might well wonder how the millions of cells in the body live. From the references to the life of the amœba you will remember that it lives in water and draws its sustenance and oxygen from that liquid, and throws its waste back into the same medium. The living cells of the body are also bathed in a liquid. This

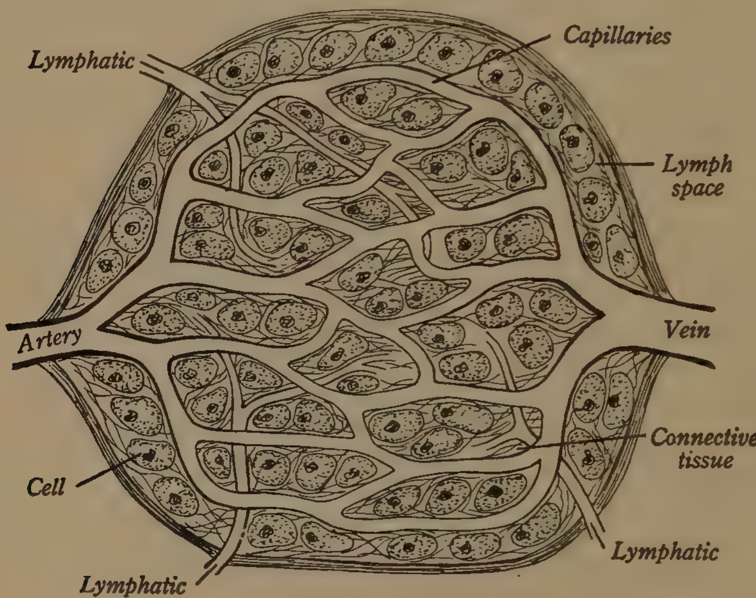



FIG. 7. Diagram of the relation of the cells of an organ to its blood vessels, lymphatics, and connective tissue

is called the lymph. When the skin is bruised or blistered we often see a rather clear waterlike fluid; this is lymph, which saturates the tissues. It is derived from the blood mainly by filtration through the walls of tiny blood vessels. The blood itself, except in cases of injury, does not come directly in contact with the living cells. The masses of tissue, however, are permeated by very tiny tubes called capillaries (from *capillus*, "a hair"), which carry blood. The diluted food and the oxygen in the blood pass through the walls of these capillaries

into the lymph, where they are readily absorbed by the cells. These cells in turn throw off carbon dioxide and waste products, which pass into the lymph and then through the walls of the capillaries into the blood stream again. Thus we see that the real process of nutrition and breathing is a cell process. In between the cells there are tiny open tubes called lymphatics into which the lymph drains. These smaller lymphatics finally combine into larger ones and empty into a large blood vessel in the neck. In different parts of the body lymphatic glands secrete lymph. It is important to note that there are two kinds of circulation involving two different sets of tubes, the lymphatic circulation and the blood circulation. Let us now turn our attention to the blood.

**15. The work of the blood.** The blood is contained in a closed system of tubes, the blood vessels, within which it is kept circulating by the force of the heartbeat. The tubes carrying blood *from* the heart are called arteries and those carrying it *toward* the heart, veins. The capillaries are the tiny tubes connecting the arteries and veins.

The blood carries to the tissues foodstuffs after they have been prepared by the digestive organs. It transports to the tissues oxygen which it has absorbed from the air in the lungs. It also carries off from the tissues carbon dioxide ($CO_2$) and various waste products to be eliminated by the lungs, kidneys, and large intestine.

The circulating blood is also concerned in the distribution of heat. Heat is produced by oxidation in the tissues. By oxidation we mean that oxygen combines with tissues and burns them up in somewhat the same way that it unites with the carbon of wood when it is burned up in a fire. Every time we move a muscle heat is produced. We all know how quickly we can dispel a chill by vigorous exercise. Oxidation or combustion warms the muscles and the blood that flows through them. The blood then carries its heat to the less

active parts of the body, especially to the skin and lungs, where it is dissipated.

The blood also carries substances called hormones. A hormone is a chemical compound produced in a definite locality, usually in the glands of internal secretion (see Chapter X), but having its effect elsewhere in the body. The thyroid gland, for example, manufactures a product (thyroxin) which is distributed by the circulation and helps the body to expend energy.

**16. The distribution of the blood.** The question is sometimes raised whether the blood is always distributed to the different parts of the body in the same proportion. When the blood is forced from the heart it is sent to the different organs and tissues in amounts which correspond to their activity. After growth has been completed, bones, tendons, and cartilages require small amounts of food material. During the digestive process after eating, the glands are quite active and must be supplied with a constant flow of blood from which their products are formed. During active exercise the muscles must receive an increased supply of blood. Hard mental work requires a liberal supply of blood for the brain.

**17. The plasma of the blood.** To the eye the blood seems red, but a microscopic examination shows that the color is due to the presence of a large number of tiny bodies called red corpuscles, floating in a colorless liquid called plasma. Owing to the minute size of the corpuscles their color when seen under the microscope is a faint yellowish red, but when seen in mass they exhibit the well-known blood-red color, which varies from scarlet in arterial blood to purplish red in venous blood. The color is dependent on the amount of oxygen contained in the blood in combination with a substance known as hæmoglobin. The liquid part of the blood forms more than half of its volume. The plasma is largely the blood minus the red corpuscles.

The blood plasma is a complex solution. It contains proteins, sugar, fat, and salts in small quantities. These all play some part in the activity of tissues.

The plasma contains very small amounts of waste products. This approximate purity is due to the efficiency of the excretory organs, especially the kidneys. Carbon dioxide, however, is found in relative abundance and also is carried in the corpuscles.

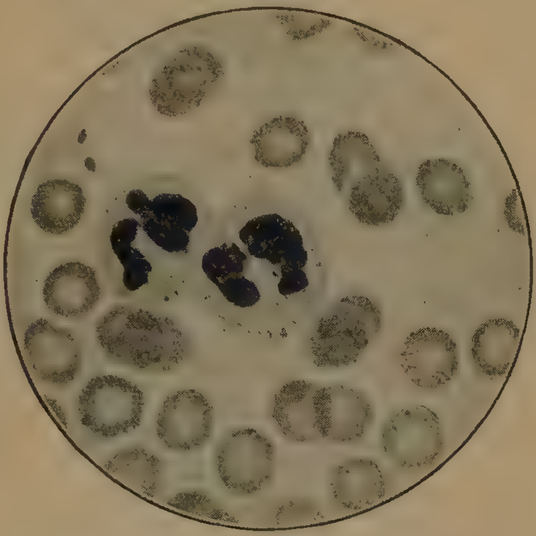


FIG. 8. Human blood corpuscles as seen under the microscope

Magnified 1000 diameters. The circular disks are the red blood corpuscles. Near the center are two white corpuscles, with their nuclei deeply stained

**18. Red corpuscles.** The red corpuscles appear as flattened circular disks with a diameter of $\frac{1}{3200}$ of an inch. In the blood there are about five million corpuscles in a cubic millimeter, the space occupied by a grain of coarse salt. The number, however, may vary on account of disease.

Each red cell is a delicate sac containing hæmoglobin. This substance possesses the property of uniting with the oxygen of the air. Its function is to carry oxygen to the tissues. As the blood flows through the tissues, close to the cells which are consuming oxygen, the corpuscles give off some of the oxygen and absorb carbon dioxide, which is later replaced by oxygen when the blood comes in contact with the air in the lungs.

The development of the red corpuscles in adults takes place in the red marrow of the bones. The formation is fairly active

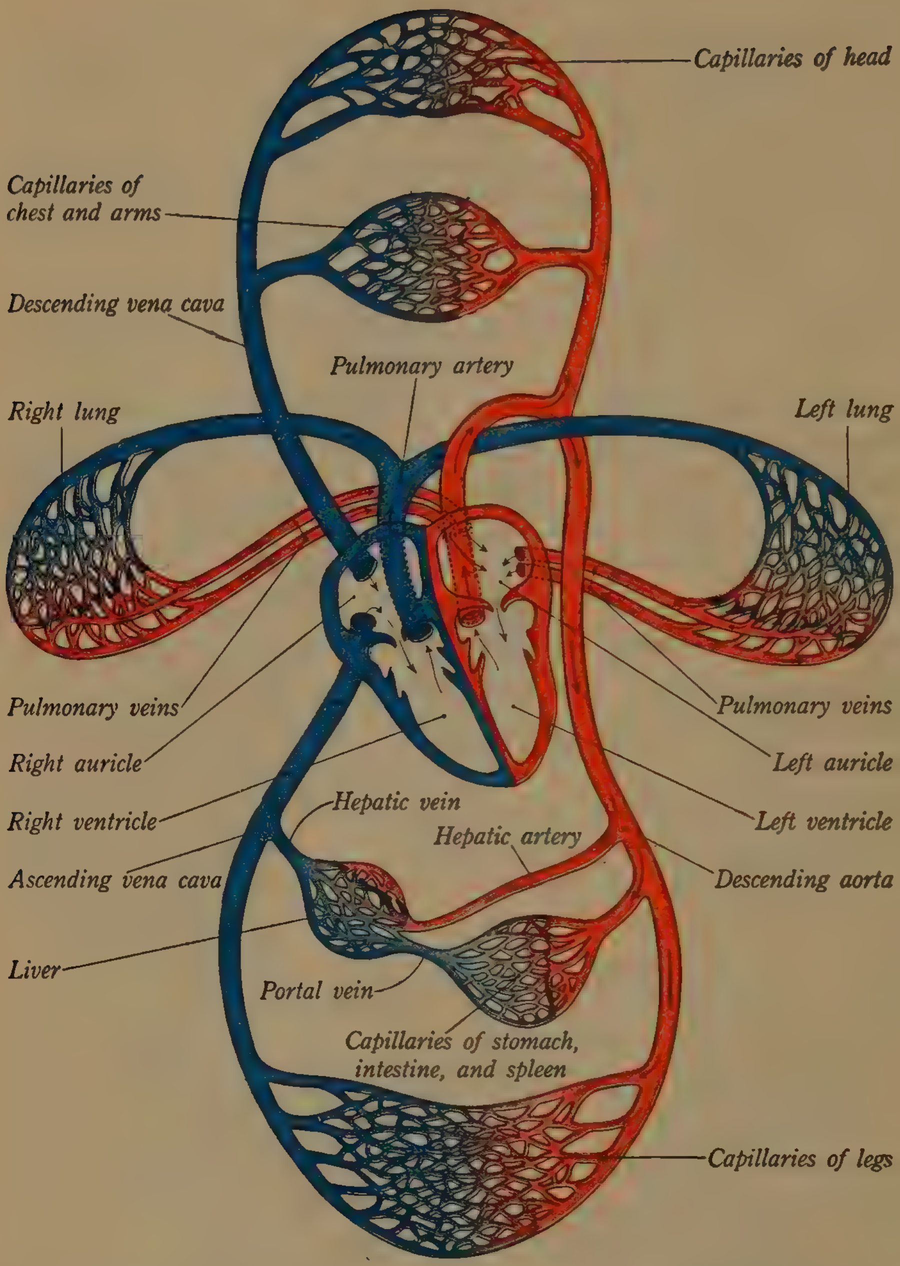



FIG. 9. Diagram of the circulation of the arterial and venous blood in the body

to replace those that have become aged and broken down in the liver, where their remnants are employed in the formation of the pigments of the bile. The length of life of a red corpuscle has been estimated to vary between two and four weeks.

The reduction in the number of red corpuscles or the reduction in the hæmoglobin content of the cells greatly diminishes the oxygen-carrying capacity of the blood and leads to a deficiency in the aëration of the tissues. The term "anæmia" indicates that the blood contains an insufficient number of red cells; this deficiency may be caused either by a decreased production or by increased destruction. Blood counts and hæmoglobin tests are now employed by physicians to ascertain the number of red corpuscles and the percentage of hæmoglobin to determine the nature of disease. Such investigations often show whether a patient is improving.

**19. White corpuscles.** The white corpuscles are so called because they are colorless. They are irregular in outline and alter their contour constantly, in a way similar to that of the amœba, and they vary in size, which is a property of importance to the physician. The larger ones are known as leucocytes and show decided changes. In the blood stream they are usually found in the outer zone of the plasma, where they attach themselves to the wall of the vessel. They proceed from place to place, their movements being slow in comparison to that of the red cells. The proportion in health is that of one white corpuscle to seven hundred red cells.

On account of the amœboid movements the leucocytes are capable of surrounding and destroying foreign particles that may have entered the blood stream. This process is called phagocytosis.

The leucocytes are able to pass through the thin wall of the small capillaries and, leaving the blood stream, to enter the tissues when necessary, to engulf and digest invading disease-producing organisms. Their service as soldiers or policemen in

fighting microbic invasions is one of the most dramatic stories in human physiology.

**20. Blood plates.** The blood plates are irregular-shaped masses smaller in size than either the red or white corpuscles. They are quite sensitive, quite perishable. The average life of a platelet is three days. They also have amœboid movements and play an important part in the coagulation of the blood. The number of platelets, normally about 300,000 to 400,000, becomes greatly reduced in the case of certain diseases. This is especially true in hemorrhage diseases.

**21. Coagulation.** Under normal conditions the blood in the vessels is free-flowing, but it quickly assumes a gelatinous state shortly after it has been brought in contact with a foreign body or with a wound.

When blood is collected in a glass vessel it becomes gelatinous or tenacious in a few minutes. It is said to coagulate. The capacity of the blood to coagulate is of great importance to arrest bleeding and hemorrhage by sealing over the cut or torn surface.

The clotting of blood varies with individuals, requiring on an average about five minutes. It is also dependent upon the physical condition of the person. Whenever the coagulation time is prolonged, so that an excessive loss of blood occurs, causing a grave danger of bleeding to death even from slight wounds, one is said to be a bleeder, or hæmophilic. At present the cause is not known, but is inherited in certain lines of descent. As a rule, this disease affects males only, but it is transmitted through the female only.

Tests known to physicians as "bleeding time" and "clotting time" should always be made prior to tonsil and adenoid operations. In a normal healthy person the clotting should take place within eight to ten minutes. Bleeding from an ordinary pin prick should stop within five to eight minutes.

The clotting of the blood is due to the production of a gummy

compound called fibrin, which appears in the form of delicate threads. These threadlike filaments arise from the broken-down blood plates. The filaments enmesh the corpuscles, without which the clot would have little firmness.

Clotting of the blood may take place in the blood vessels if conditions arise which cause the destruction of the blood plates. An injury to the vessels may cause the blood plates to collect on the sides, with the ultimate formation of a clot, which physicians call a thrombus. Part of the clot may become detached and be forced into the circulation, to be finally lodged in one of the smaller vessels, thereby interfering with normal circulation and the usefulness of the parts which this vessel supplied. If one of these clots becomes lodged in an artery of the brain or heart, it may cause sudden death.

When a person has lost a great deal of blood the deficiency may be supplied through transfusion. The blood of a healthy person is introduced into the patient by means of a glass syringe. Before doing this it is necessary to know that the blood of the person to be used will not act as a foreign substance and thus cause destruction of the blood. This assurance is secured by a matching test. If the blood of the two persons mixes normally the operation is safe.

**22. The circulation.** In order that the blood may serve its proper function it must be kept in constant motion throughout the body. This is accomplished by means of the heart, the arteries, and the nerves. The heart serves as a force pump which maintains the flow of blood.

**23. The heart.** The heart is divided by a partition or septum into a right and a left half. Each half is again divided transversely into what is known as an auricle and a ventricle. Thus the heart consists of four chambers. The blood as it returns from the systemic veins is conveyed to the right auricle, while the blood from the lungs is directed into the left auricle. The blood which leaves the heart comes from the ventricles. That

vessel which arises from the right ventricle is called the pulmonary artery, while the blood coming from the left ventricle flows through the aorta. Normally there is no interchanging of blood between the right and the left side of the heart. The blood from the systemic veins passes into the right auricle, thence into the right ventricle, and then into the pulmonary arteries, which lead to the lungs. After it has passed through the capillaries of the lungs it is returned to the heart by the

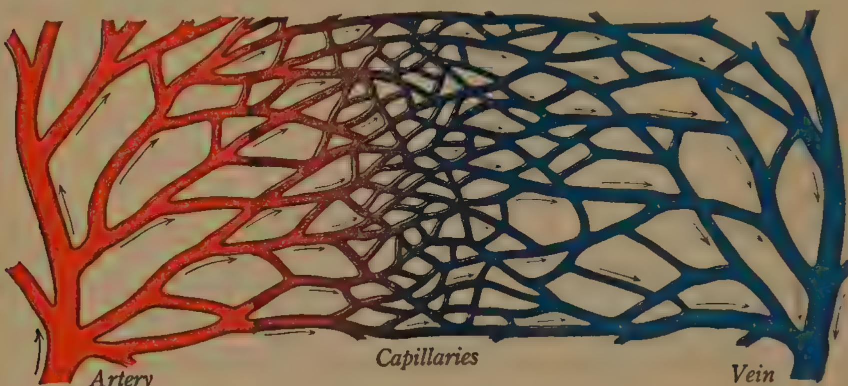



FIG. 10. The blood flows *from* the arteries *through* the capillaries *into* the veins

pulmonary veins and enters the left auricle, the left ventricle, the aorta, and finally the general circulation throughout the body. It returns through the systemic veins to the right auricle.

The blood is discharged from the ventricles in rhythmical spurts with intermittent pauses. This can be verified by making a slight pressure with the finger upon the more superficial arteries, such as the one at the wrist. The movement of the blood in the smaller arteries, as well as the veins, becomes more steady. The elasticity of the arteries causes them to dilate when blood is forced out of the heart and to exert additional pressure upon their contents. By the contraction of the arteries during the resting period of the ventricles the flow is continued into the smaller branches, capillaries, and

veins. During old age this process may be interfered with in persons having hardening of the arteries. The arteries do not yield, thus causing a greater demand upon the heart at a time of declining strength, so that the expectation of life is greatly reduced either by the heart's failing or by the breaking of some weakened artery.

**24. The cardiac cycle.** The contractions of the heart are rhythmical; that is, they occur in a certain definite regular order. First, there is a simultaneous contraction of the walls of both auricles; following this, there is a simultaneous contraction of both ventricles. Then comes a pause or period of rest, after which the auricles and ventricles contract again in the same order as before, and their contractions are followed by the same pause as before. The state of contraction of the heart is known as systole, and the state of relaxation as diastole. A complete contraction of the heart, beginning in the auricles and ending with the pause in the ventricles, constitutes a heartbeat, or cardiac cycle.

In round numbers, the normal heartbeat of an adult man is seventy per minute, that of a woman is eighty, and that of children is ninety; each heartbeat takes 0.8 of a second. About half of the time is occupied by a period of rest. When the rate of the heartbeat is increased, the period of rest is shortened. When the heartbeat is raised to 140 or 150, it is obvious that the period of rest is practically eliminated. Muscular exercise, as we all know, increases the heartbeat profoundly, whereas rest and sleep decrease the normal rate.

**25. The valves of the heart.** As has already been pointed out the blood flows through the heart in a fixed direction. Each cardiac cycle begins by the contraction of the two auricles. Immediately upon the completion of the contraction of these chambers, the ventricles begin their systolic movement. To prevent the blood's being forced back into the auricles, the valves guarding the openings between auricles and ventricles

close; thus the blood flows only in one direction. During the pause in the heart cycle the blood is likewise prevented from flowing back, this time from the distended pulmonary artery and the aorta, by another set of valves. There are thus two sets of valves guarding the flow of blood through the heart: those between the auricles and ventricles and those between the aorta and pulmonary artery and the ventricles.

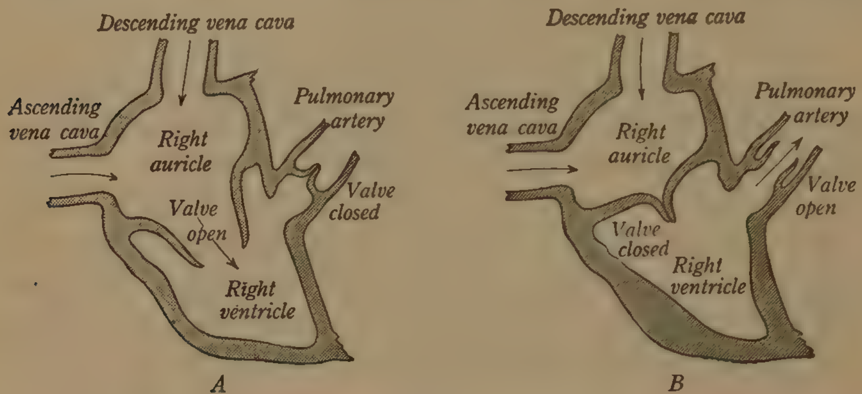



FIG. 11. A diagram of the right side of the heart showing the working relationship of the valves

When the blood flows into the auricle and the ventricle relaxes, the valves of the heart are as shown in *A*. When the ventricle contracts and the blood flows out into the arteries, the valves are as shown in *B*

The amount of blood which is forced from either ventricle during contraction is about four ounces. It is estimated that all the blood of the body may be pumped in the course of fifty beats of the heart. Thus the average red corpuscle may make the circuit of the circulation from a given point, and return in less than a minute. During exercise, when more blood is needed, this demand is met by the increase in the rate of the heartbeat and perhaps by the increase in the amount discharged at each contraction.

**26. Nervous control of the heart and arteries.** The heart is something like a horse in harness. There are two sets of nerves

which influence the rate of the heartbeat. Those which quicken the beat are termed cardio-accelerators and those which slow down the action of the heart are called cardio-inhibitors. The complete description of this mechanism is too complicated to be considered here.

The automatic control of the caliber of the blood vessels is very interesting. The large arteries are essentially elastic tubes consisting of an outer, a middle, and an inner portion. The middle portion consists of plain muscle fibers which are under the control of nerves. They cause the walls of the blood vessels to be in a state of constriction alternating with dilation. Their tone, or degree of muscular contraction, may be varied so as to make them larger or smaller. This mechanism enables the blood to be sent to parts of the body where it is most needed. During muscular exercise there is an increase in the amount of blood sent to the skin, so that heat may be dissipated. At the same time there is a constriction of the blood vessels associated with the digestive system. Not only are the nerves of automatic control delicate mechanisms to change the blood vessels according to the temperature and needs of the body, but they are responsive to the emotions. Blushing, for example, is a congestion of blood in the face caused by these nerves.

The control of the heartbeat and circulation is beyond the power of the will.

**27. The blood pressure.** The taking of the blood pressure today is one of the routine things in a regular physical examination of adults. It is obvious that pressure must be applied to the blood to force it through the closed system of tubes throughout the body. This is performed in part by the pressure of the muscles on the blood vessels, the elasticity of the walls of the arteries, the resistance in the capillaries, and the volume and viscosity of the blood, but the chief source of pressure is the beating of the heart. The increased pressure in

the arteries after each heartbeat is taken up rapidly by the elasticity of the walls of the arteries. The pulse indicates the rise and fall of this pressure. Unless there are abnormal conditions present in the circulatory system this pressure is sufficient to carry the blood back to the heart.

It is only within recent years that we have been able to measure blood pressure. The instrument, in its usual form,

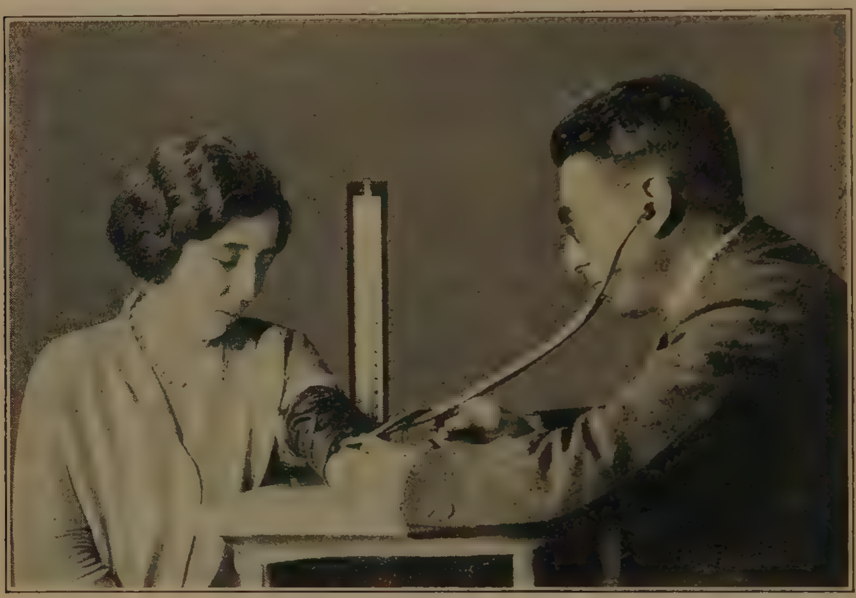


FIG. 12. The Sphygmomanometer

An interesting device for testing the blood pressure

consists of a rubber cuff which may be inflated and is connected by a tube with a column of mercury. The usual method of testing the blood pressure is to wrap the cuff of the sphygmomanometer around the bare arm above the elbow and to pump air into the cuff until the pressure exerted by the blood within the artery of the arm is completely overcome. The air is then let out gradually through a valve until the pulse can *first* be felt, or heard as a clear, loud sound through a stethoscope applied under the cuff. This is called the systolic

or maximum pressure, or the pressure with which the heart forces blood into the arteries. After noting the height of the mercury column, which should range between 110 and 120 millimeters of mercury in healthy young adults, more air is let out of the cuff until a transformation is heard of the clear, loud sound, first heard at the height of the systolic pressure, into a dull one. At this point the height of the mercury column is again read. This represents the diastolic or minimum pressure, or the pressure maintained between heartbeats. Diastolic pressure in normal adults is usually 50 millimeters of mercury less than the systolic pressure. A blood pressure of 120 means that it requires the weight of 120 millimeters of mercury to blot out the pulse.

High blood pressure is usually a symptom of some abnormal condition of the body. The causes are many, such as decayed teeth, diseased tonsils, and lead poisoning. High blood pressure is frequently associated with hardening of the arteries. In this condition the arteries lose their elasticity and become rigid tubes. Also their capacity is decreased by the thickening of the walls of the blood vessels. The blood must necessarily be driven through the body with greater pressure. This throws a strain on the heart and seriously interferes with the function of the kidneys. When the blood is under high pressure, it may break through the weakened walls of the arteries. When the break comes in the brain, as is common, the catastrophe is known as apoplexy; in popular language, "a stroke." Its effects may vary from sudden death to an unreliability of the brain so slight that for a long time it is not noticed.

Although high blood pressure due to hardening of the arteries is not usually curable, it may not be serious for a long time if the person will form the necessary health habits upon the advice of a physician.

The blood stream not only contains nutritive material resulting from the eating of food but also the waste products of the

cells. This waste must be excreted, or thrown off, if health and life are to exist. Various organs participate in this excretory function. The lungs throw off carbon dioxide. Intestinal waste is eliminated through the large intestine. This is a process of elimination.

The kidneys are engaged in excreting a waste product called urine. They are a pair of oval or bean-shaped organs about four or five inches long, in the lumbar region at about the waist line. Each kidney has many systems of small tubes which finally carry the urine to a larger tube from sixteen to eighteen inches long, called a ureter, that leads to the bladder, where it is stored, and eventually it is discharged from the body.

The kidneys clean the blood for circulation. This task is very difficult. They take from the blood waste material and any excessive amount of useful material. At the same time they must prevent the escape of such substances as the body needs. Another important function is to keep a balance between acids and alkalies in the body. This is so necessary that even a slight variation which could be detected only by delicate tests would cause death. Finally the kidneys prevent the blood from becoming too dilute. When the kidneys are damaged so that they cannot excrete the necessary amount of water, it collects in the tissues, and dropsy appears. The appearance of albumin in the urine is often a sign of kidney trouble and may mean Bright's disease, named after Dr. Richard Bright, who first described this abnormality.

**28. A healthy heart and circulation.** The heart and general circulatory system, like other parts of the body, are affected by the habits of the individual. Nourishing food, the proper elimination of bodily wastes, fresh air, sleep, rest and recreation, and freedom from infection tend to keep the heart and circulation healthy. The heart is such a complicated machine and so essential for healthy living that we need the assistance of the expert physician to help keep it healthy. For this reason

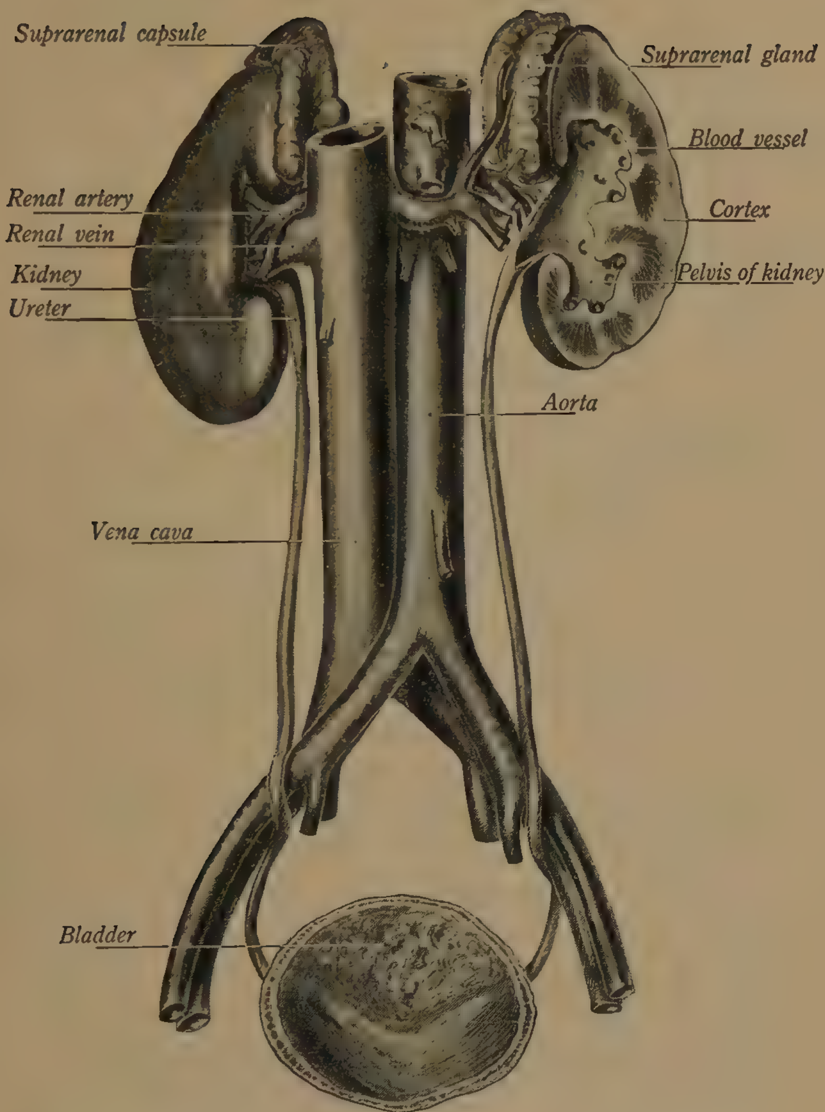



FIG. 13. An anatomical study of the pathways for the excretion of urine

The kidneys filter from the blood waste products, in the form of urine, which are subsequently eliminated from the body via the ureters and bladder

periodic health examinations (see Chapter XXIX) are desirable, since early and slight stages of heart trouble may be detected and chronic infections likely to injure the heart may be removed. We are beginning to realize more and more the need of the doctor to help keep us healthy.

### *For Informal Discussion in Class and at Home*

**1.** What causes high blood pressure? Is it always serious?

**2.** How do the surroundings of the amœba differ from those of the cells of the body in regard to obtaining food?

**3.** What organs of the body are responsible for keeping the blood stream free from injurious substances? What serious results will follow if these organs fail to do their part?

**4.** Try this: Count your pulse rate while at rest. Run in place, raising knees high, for fifteen seconds. Immediately count your pulse rate. Count it at the end of thirty seconds; one minute; a minute and a half and longer if necessary. How soon does your pulse rate return to normal after the run? Consult your health teacher or doctor to find out whether your heart recovers satisfactorily.

**5.** We all know that through physical exercise the muscles of the body can be made stronger and more enduring. Is this true of the heart? Would a stronger heart be of advantage to health? How would you proceed to strengthen your heart? Are precautions necessary?

**6.** Why is it necessary for the heart to beat faster during exercise? Why should it return to normal after the body is quiet?

**7.** Does the heart beat faster during excitement? Why?

**8.** What can one do to have a healthy heart and a healthy circulation?

**9.** Make an outline of this chapter.

**10.** What is the work of the blood?

**11.** What is the lymph? Describe its work.

**12.** Make out a list of review questions on this chapter.

# CHAPTER III

## THE BREATH OF LIFE

**29. Every living thing breathes.** Everything that lives must have oxygen. Confine a plant or an animal in an oxygen-proof jar and it will die, although it may have an abundance of sunshine, moisture, and food. The essential part of the air for animals is oxygen. Without oxygen the cells of which the body is composed cannot function, and death soon results. In high-mountain climbing it is necessary for the climbers to take tanks of oxygen with them because as one ascends the supply of oxygen diminishes.

The cells at work need oxygen, and they throw off wastes in the form of carbon dioxide and other products, due to the using up of the tissues. The cells in most organisms get their oxygen through the blood and they also throw off their products into the blood. The complete process of breathing, or respiration, varies with different forms of life. The lower forms of life, such as the amœba, breathe through their outer surfaces. The exchange of gases takes place directly by contact with the air. An earthworm also breathes directly through its skin. A fish breathes through its gills. The gills are well supplied with blood vessels which come close to the surface. The oxygen in the water is absorbed into the gills of the fish, and the waste product is thrown off into the water. The frog has a bag within his body. This bag is well supplied with blood vessels. In this bag the exchange of gases takes place. Notice a frog in the water and observe that at intervals he comes to the top, forces air out of his mouth, opens his mouth to get more air, and then dives below. The lungs of man might be thought

of as a bag containing thousands of smaller bags to facilitate the process of respiration. Let us turn first to the more intimate study of the upper respiratory tract, consisting of the nose, mouth, and throat.

**30. The importance of the nose in breathing.** Nature intended that man should breathe through his nose, which is admirably adapted for its work. This organ is made up of bone and cartilage. There are two passageways, or nostrils, for the reception of the outside air. Mucous membrane lines the entire nasal cavity and is well supplied with blood vessels. The blood vessels warm the incoming air. Mucus is secreted by this membrane, and this mucus moistens the air. Hairs in the nose act as filters and so offer a protection against dust.

Opening into the interior of the nose there are cavities or spaces, called sinuses, filled with air. All the sinuses open directly into the nasal cavity and are lined with mucous membrane. During infections of the nose and throat, especially colds in the head or the infectious and contagious diseases, the sinuses become inflamed. If such inflammations are neglected they have a tendency to become chronic, and sinusitis (so-called nasal catarrh) is the result. Headaches and painful areas in the face are not unusual when the sinuses become congested and inflamed during ordinary colds.

The mouth is described in detail in Chapter VII. We should notice here, however, that the roof of the mouth is called the palate and is divided into two connecting parts, the hard palate in front and the soft palate behind. The soft palate forms the arch of the roof of the mouth behind, and from it is suspended the familiar little tab called the uvula.

**31. The throat.** Behind the arch of the soft palate is the throat, or pharynx. Below it is the larynx, or voice box, containing the vocal cords. Leading from the larynx is the trachea, or windpipe, which in turn leads into the bronchial tubes of the lungs.

On either side of the base of the tongue is located a tonsil. The tonsils are rounded oblong masses of lymphoid tissue — a part of the lymphatic system — held in place by two small muscles extending vertically in front and behind. These are known as the anterior and posterior pillars of the tonsils. Each tonsil is covered with mucous membrane of a pale-pink

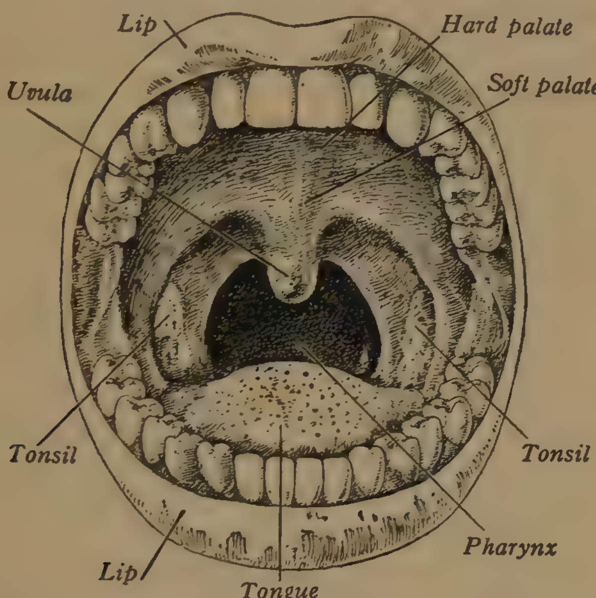



FIG. 14. When the examining physician directs you to open your mouth and say "Ah," this is what he sees: pharynx, tonsils, uvula, soft palate, hard palate, tongue, teeth, and lips

color, and to the naked eye it has a smooth surface. Beneath the apparently smooth surface are crypts which, when the tonsils are diseased, become filled with bacteria and pus. The tonsils are usually visible, although occasionally they are deeply embedded within the recesses of the pillars, which makes inspection difficult. When the tonsils are diseased they are plainly seen when the mouth is opened wide. Above and behind the tonsils are the openings of the Eustachian tubes, that lead into the ears.

The region where the posterior opening of the nasal cavity communicates with the pharynx is called the nasopharynx. In this space, located on the pharyngeal wall, is found the adenoid tissue, which is the seat of much trouble during infancy and early childhood. Enlarged growths of it, called adenoids, are the principal cause of nasal obstruction.

**32. Nasal obstruction.** From 10 to 15 per cent, or about three million, of the school children in the United States suffer from nasal obstruction. This is a serious matter, since the nose and throat have long been known to be portals for the entrance of bacteria causing the infectious and contagious diseases, of which diphtheria, pneumonia, and rheumatism are notable examples.

Through its normal tonsils and adenoid tissue nature provides means to combat organisms that find their way into the upper respiratory tract. These points are stations for white corpuscles, that devour injurious bacteria. All the other tissues of the upper respiratory tract offer resistance. But when these tissues become enlarged or diseased, interfering with breathing or turning poison into the blood stream, the health of the individual is seriously affected. Persons who suffer from nasal obstruction are more susceptible to disease and are often found to be carriers of diphtheria, scarlet fever, and meningitis.

Among the chief causes of nasal obstruction are enlarged and diseased tonsils, adenoid growths, abnormal growth of the bones of the nose, and injuries to the cartilage and bones of the nose. Nasal obstruction develops gradually, and practically always begins during infancy and early childhood.

Repeated and neglected attacks of colds in the head, grip, and other infectious diseases predispose to nasal obstruction. Irritation of the mucous membrane of the nose and throat from foul and vitiated air, overheated and poorly ventilated rooms, thumb-sucking and the use of pacifiers, malnutrition, and rickets all contribute to nasal obstruction.

**33. Detection of nasal obstruction.** The individual with a nasal obstruction is likely to have a dull facial expression. This is due in large measure to his usually being a mouth breather. Unable to get air through the nose because of the obstruction, he breathes through the mouth. Children who are mouth breathers suffer from loss of appetite because the tongue is dried by air passing over it instead of through the nostrils; the sense of taste is lost. Sleep at night is disturbed through inability to breathe naturally. Snoring is common. Many of these children have night terrors. During sleep infants and young children sometimes assume the "knee-chest" position, which is an indication of nasal obstruction. They take this position to bring the soft palate forward in an effort to get air past the adenoid growth.

**34. Common results of nasal obstruction.** When there is some interference with nasal breathing, the air reaches the lungs through the mouth instead of the nose. The warming, moistening, and filtering functions of the nose are lost. The air reaches the lung at a temperature lower than that of the body. Such direct and repeated chillings result in colds, bronchitis, and pneumonia.

Nasal obstruction leads to a congestion of blood in the brain. This interferes with the action of the brain, often leading to backwardness in the case of children.

Voice and speech defects often result from mouth breathing. Children will say "teet" for "teeth," "sog" for "song," "doze" for "nose," and "Sprig is cubbig" for "Spring is coming." Such habits may be carried over to later life if the obstruction is not treated.

Nasal obstruction is bound to affect the body as a whole. It results in poorer resistance to disease, in indigestion, in malnutrition, and induces poor posture. Children who fail to make normal gains in weight often gain rapidly after the nasal obstruction is removed. Swollen glands of the neck,

chronic sore throat, rheumatism, infections of the middle ear, and deafness are common results.

**35. Hygiene of the nose and throat.** Suggestions on the care of the nose and throat follow:

Prevent acute infectious and contagious diseases during infancy and childhood.

Have proper medical care of disorders of the upper respiratory tract.

Do not consider children with contagious diseases cured until all discharges from the nose and throat have disappeared.

Learn to dress healthfully. Overdressing as well as not dressing warmly enough produces nasal congestion and colds.

Live in well-ventilated rooms during the day and at night.

Any member of the family who is ill with a transmissible disease should be isolated from the rest of the family group. This action limits the spread of disease.

Avoid use of pacifiers and other articles in the baby's mouth.

Never kiss a child on the lips. Disease carriers are all too common.

Avoid use of nasal douches, patent medicines, and household remedies in the treatment of nose and throat disorders. Follow the instructions of a physician and insure yourself against complications.

Tonsils and adenoid growths should be removed when there is evidence that they are diseased — the earlier the better.

Procrastination causes secondary involvement of the accessory nasal sinuses, middle-ear disease, and predisposes to many of the contagious and infectious diseases. This should lead parents to have diseased tonsils and adenoid growths removed early in the child's life. One year of age is not too young.

Children should be taught how to use a handkerchief properly and how to clear the nostrils without forcing the nasal infection into the ears.

Nasal sprays for children are too frequently administered under pressure and should never be used. Medicated nose drops are safer. Suction by means of mechanical aspirators offers the best relief. Surgical treatment for the relief of nasal obstruction due to

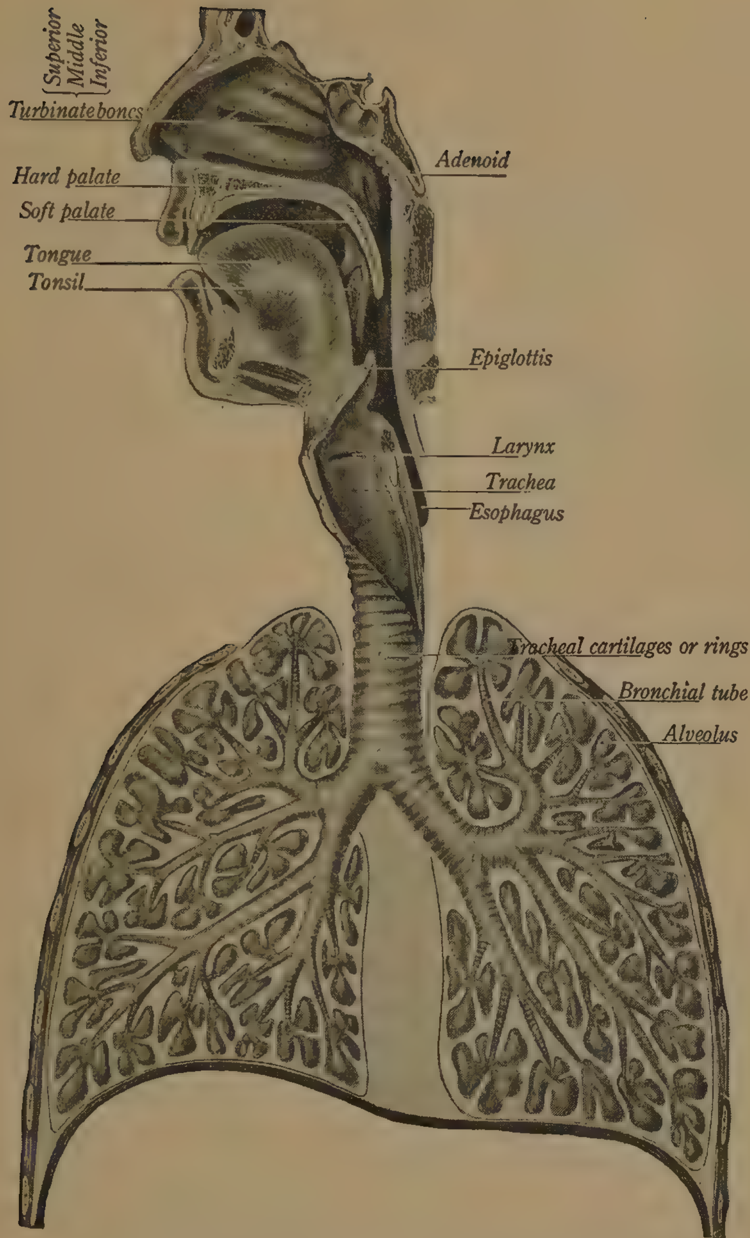



FIG. 15. A diagrammatic illustration of the organs of respiration

Study this with the help of the text

enlarged turbinates and deviated septums should be deferred until the child has reached the age of fifteen or sixteen years. Other obstructions, such as polyps and nasal spurs, may be removed earlier.

Many children continue to have colds even after the tonsils and adenoids have been removed. This is due to the failure to remove these organs before the infection has spread to the accessory nasal sinuses. The same diseased conditions which predisposed to colds before the tonsils and adenoids were removed still remain, despite the operation. In such cases treatment should be directed to the diseased sinuses.

There are many individuals whose mucous membranes are hypersensitive to foreign substances in the atmosphere, and as a result they suffer from hay fever and asthma. The disturbing elements may be pollen from trees, plants, grass, or flowers; or they may be from animal emanations, as in the case of sensitiveness to cat, dog, and horse hair, goose and chicken feathers. Cures may be obtained with a large percentage of such patients if specific pollen and foreign-protein treatment is administered.

**36. The work of the lungs.** The air entering through the nose is drawn through the pharynx and the trachea, or windpipe, into the bronchial tubes (bronchi) of the lungs. These tubes subdivide into many smaller branches until the whole lung is penetrated in a manner similar to the branches of a tree. Each tiny tube finally ends in a dilated sac called an air cell, where the interchange of gases takes place. It is estimated that there are four hundred million of these air cells in each lung.

The wall of an air cell consists of a layer of flat thin cells continuous with that of the bronchi and the mucous membrane of the air passages. The lining cells of the trachea have cilia, or hairlike processes, which catch the particles of dirt or dust which have been breathed in. The tendency of the cilia is to make quick upward movements, carrying the particles of dust with them.

The walls of the air cells have blood vessels that are separated from the air in the cells by a very thin tissue. The blood in

these tiny tubes is heavily laden with carbon dioxide, which it has collected from the working cells, and this has diminished its supply of oxygen. Since gases or liquids tend to distribute themselves equally when separated by a thin membrane, there is a movement of the gases as indicated in Fig. 16. As the blood leaves the lungs it has discarded its wastes and has taken on oxygen. Meanwhile the air in the cells, laden with a high amount of carbon dioxide, has been forced out and fresh air has been drawn in to take its place.

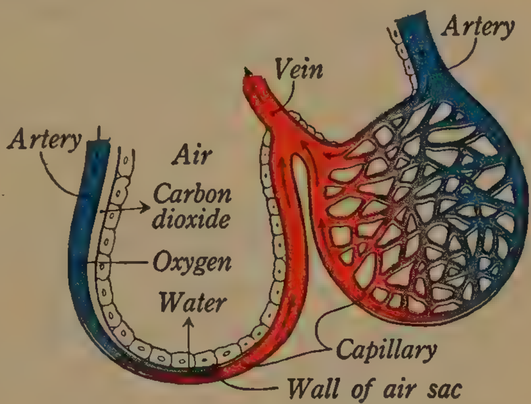



FIG. 16. Air sacs in the lung

Notice that the blood capillaries lie in the very thin walls of the air sacs. Trace the blood from an artery through the capillaries to a vein. Observe that in the process carbon dioxide and water pass into the air sac while oxygen passes from the air sac into the blood

**37. The pressure of the air.** The air is composed of a mixture of gases. Oxygen comprises 20.99 per cent, nitrogen 78.03 per cent, carbon dioxide .03 per cent, and other gases make up the remainder. These gases press in upon the surface of the body with the force of fifteen pounds to the square inch. Movements of the air occur only when there are differences of pressure. Air moves from areas of high pressure to areas of low pressure.

As long as the chest is without movement and the passages to the outside air are open, the air pressure within the lungs is the same as that without. As soon as the chest cavity is enlarged, the lungs, having been somewhat collapsed like a bag, now follow the chest wall. The pressure within having been diminished, the constant pressure of the outer air forces more air in through the trachea until the pressure is again balanced.

When muscular effort is brought to bear to decrease the size of the chest, the opposite movement occurs.

**38. The control of respiration.** There are three different forces which control the respiration: first, there is the constant force of atmospheric pressure; secondly, the elasticity of the lungs; and thirdly, the power of the chest to enlarge itself. This last is brought about by muscular action.

It should be remembered that the lungs cannot increase or decrease their capacity by themselves. The movements of the chest and the diaphragm wall are responsible for the variations in the size of the lungs. Let us see how this is brought about.

The chest cavity is enlarged by lifting the ribs. When the chest is at rest the ribs slant forward and downward at an angle of fifteen or twenty degrees from the horizontal. Raising the chest lifts the sternum and ribs away from the spinal column. This enlarges the chest from front to rear and also increases the diameter from side to side. The lifting of the ribs comes through muscular effort.

Stretched across the lower part of the chest cavity is the diaphragm, a muscle which tends to curve upward in a dome-like fashion. It divides the thorax, or chest, which contains the heart and lungs, from the lower, or abdominal, cavity containing the stomach, intestines, and other organs of digestion.

When there is an expiration, or the air is being forced out of the lungs by the lowering of the ribs, this lower floor tends to rise and so help to decrease the size of the cavity; but when the ribs are lifted, the diaphragm is lowered by contraction and so helps to increase the size of the cavity.

It is interesting to note that the chest is more easily lifted when the head is held in an erect position and the shoulders are not permitted to droop forward.

Normal expiration, or the forcing of the air out of the lungs, is largely a passive act. When the muscles of inspiration relax,

the air is expelled by the elasticity of the lungs, the weight of the chest, and the elasticity of the abdominal wall.

**39. Breathing exercises.** The size and mobility of the chest are matters of the greatest importance. The greater the amount of air which the lungs can accommodate and the more air there is in the lungs, the more the blood is exposed to the air. This means a greater gaseous exchange.

The regulation of the amount of movement in breathing so as to satisfy the needs of the body during exercise, rest, waking, or sleeping is automatic. We can, however, modify the rate and depth of breathing by voluntary action. We can also change its manner.

Breathing movements are subject to educational control, similar to any other coördination of the body. It is for this reason that singers and teachers of voice culture pay special attention to the development of the chest, so that inhalation and exhalation shall be such as to produce the best quality of voice. The possibilities of control of inhalation and exhalation have a wide range.

Those who participate in vigorous athletic events learn to adjust their breathing to the activity so that it will result in economy of muscular and nervous energy.

Two kinds of exercises for the development of the lung capacity are recognized: voluntary deep breathing and deep breathing induced by means of vigorous exercise, such as running and athletic games.

1. *Voluntary deep forced breathing* requires the lifting of the chest (which in itself requires considerable effort) and brings into action many muscles requiring oxygen and the elimination of waste. If the exercise is done slowly (requiring about four seconds for inhalation and four seconds for exhalation) and performed vigorously it meets the requirements of any physical exercise. All rhythmic exercises should be accompanied by free breathing. The practice of deep breathing ventilates, or,

as Storey says, "washes out," and aërates the rarely used portions of the lungs. It exercises the auxiliary muscles used in deep breathing and increases the mobility of the chest.

There are many who cannot endure vigorous exercises: those who are underweight, those who are narrow-chested and have physical defects, and those who have a difficulty in respiration — the pretuberculous, asthmatic, and the like.

Deep breathing and vigorous exercise are undesirable in active diseases of the lungs. The lungs attempt to heal over the diseased spots, but deep breathing breaks down the affected area and may cause a hemorrhage from the ruptured wall of the cavity.

2. *Special breathing exercises.* Except in particular cases already noted, special breathing exercises seem to be unnecessary and may even be harmful. It is usually assumed that it would be desirable for everybody to increase his lung capacity. The development of the lung capacity, without a corresponding development of the heart, blood vessels, and muscles, such as is advertised by certain specialists, does more harm than good. Ordinarily we do not need larger lungs to be healthy, any more than we need a larger stomach. It is easy through forced breathing to increase the lung capacity, but it is a useless art unless the individual increases his amount of exercise, which we know calls upon nearly all the organs of the body for action.

The chief reason for the futility of special breathing exercises is that respiration is controlled automatically. The rate and depth of respiration are controlled by the amount of carbon dioxide in the blood. When the amount of carbon dioxide in the blood increases as a result of exercise, the rate and depth of respiration are increased in order to remove wastes. The activity of the muscles of respiration is directed by a group of nerve cells situated in the medulla oblongata, an organ at the base of the brain. The mechanism which controls the beating of the heart is practically the same as that which controls the

respiratory movements. The slightest possible increase in the amount of carbon dioxide in the blood causes a decided increase in the rate and depth of the respiratory movement and also a more rapid heart action. This can be easily demonstrated by engaging in some vigorous physical exercise and afterwards noting the breathing and heartbeat. The only safe way to increase the size and mobility of the chest is to indulge in moderate exercise. Then the lung capacity is increased naturally because of bodily needs.

***For Informal Discussion in Class and at Home***

1. Refer to some standard text on biology and, making use of blackboard drawings, report to the class in detail on the breathing of plants or of some particular animal.

2. Is it safer to breathe through the nose or mouth? Why? Can you tell why many people habitually breathe through the mouth? How may this be prevented?

3. Try this: Press the finger against the outside of the right nostril. Breathe in and out. Do the same with the left. Is the movement of air through the nose free and unobstructed in both passages? If not, what is the probable cause of the defect? Is it worth while to correct such a defect? Why?

4. What causes the air to enter and leave the lungs? What is the rate per minute? What may cause a change in the rate? Give illustration.

5. Is it desirable to increase the capacity of the lungs through deep breathing? Explain.

6. What exchange of gases takes place in the tissues? in the lungs?

# CHAPTER IV

## THE AIR WE LIVE IN

**40. The vast ocean of air.** We cannot get away from the air, even if we would. It extends around the entire globe, and fills the space above us in decreasing density for possibly fifty miles. The air permeates every nook and corner of the physical world around us. It is practically impossible to produce a perfect vacuum by the most ingenious scientific device. This vast ocean of air presses down upon us with a weight of fifteen pounds to the square inch. We make use of this air pressure in filling our fountain pens and in many other mechanical devices. Currents of air on a large scale are called winds. These winds turn the windmills and fill the sails of the ships at sea, and since they carry moisture in suspension they also bring us storms and rain.

Air is a necessity for human life. We may do without water and food for many hours, but we can hold our breath with any degree of comfort for no longer than thirty seconds. The character of the air which we breathe and which touches our body is tremendously important for our health, comfort, and success. Man tries to regulate the character of the air by devices for heating and ventilating. This is especially true in temperate climates, where man spends so much of his time living indoors. Many experiments have recently been made in this field, and as a result our ideas concerning heating and ventilating have undergone considerable change.

**41. The best air to live in.** There is a general consensus of opinion today that the best air for the healthy living of man should have the following characteristics:

1. *Temperature between 65° and 68° Fahrenheit.* It has been found by experiment that this temperature is best for health and work. In factories and schoolrooms where the temperature of the air has been carefully controlled it has been discovered that any marked variation from this temperature results in discomfort and a disinclination to put forth the greatest amount of effort. Probably one of the most common faults in the heating and ventilating of homes and public buildings is overheating.

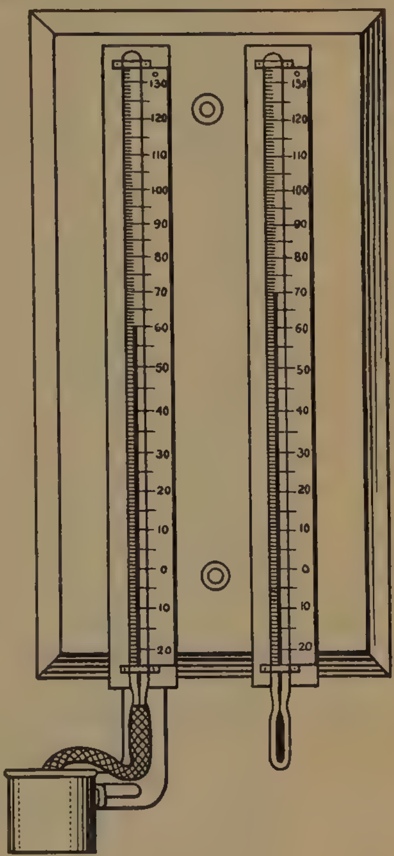


FIG. 17. A hygrometer

A useful instrument for measuring the amount of moisture or relative humidity of the atmosphere

2. *Humidity nearly like out-of-door air.* All air contains a certain amount of water. While the amount of moisture in outdoor air varies with the climate and the time of year, yet it is usually sufficient for purposes of health. In buildings ventilated by open windows, if there is no crowding, there is not likely to be any serious problem in regard to humidity. Associated with overheating, a common fault in heating and ventilating, is dry air. As the air becomes hot it expands and the moisture per cubic foot greatly decreases. Experiments show that air in some of our houses and schoolrooms is as dry as the air of the Sahara Desert, or drier. This air dries the secretions of the nose and throat, thereby laying the basis for irritation and

colds. The question of providing the right humidity for the air in our homes is a problem which has not been entirely solved. The method of testing the humidity of the air through the hygrometer is too complicated for use in the home. Look up this method of testing humidity in your science books and be prepared to report to the class.

3. *Moving air rather than stagnant air.* Moving air tends to carry heat off from the body and to supply it with fresh air. Air movement should be secured without drafts. In winter this may be secured, where there is window ventilation, by placing a board three to four inches wide under the lower sash. This allows a small space between the sashes.

4. *Freedom from dust and impurities.* Dust in the air irritates the breathing passages and may carry bacteria of disease. Some of the mechanical devices for ventilation strain the air through moist cheesecloth.

We now turn to the more detailed consideration of how these essentials can be secured through different methods of heating and ventilating.

**42. Fireplaces.** Ordinary grates and open fireplaces render available only from 7 to 12 per cent of the heat value of the wood or coal which may be used. The greater part escapes up the chimneys and furnishes practically only radiant heat to the occupants of the room, heating the part of the body directed toward the fire, while the other part remains cold. By the draft of the chimney a fireplace is apt to create strong currents of air and to draw into the room large quantities of air that has not been properly warmed, causing chilling and drafts along the floor level while the upper strata of air remain more or less contaminated, undiluted, and unchanged. The fireplace has always been associated with home in folklore and poetry and is a luxury which many people add to the structure of a house, even though a modern heating apparatus is installed.

Fig. 18. A fireplace in the home provides good ventilation

It also makes for comfort and companionship. Many a good story has been told around the blazing fire. (Courtesy of the *House Beautiful*)

**43. Stoves.** Stoves are more economical as sources of heat than fireplaces, because from 75 to 80 per cent of the fuel is made available. Stoves are less efficient as aids to ventilation, so this must be provided in some other way and should not be neglected. It must be remembered that a stove is not air-tight. Carbon monoxide and other gases, which at once contaminate the atmosphere, may leak through the openings. The production of carbon monoxide, which is seen burning with a blue flame in the fire box, is usually most abundant when fresh coal is placed on an intensely hot layer of coal. Care should be taken that the damper is open, so that the gases may escape up the chimney, otherwise fatal results may follow. Carbon monoxide is odorless, and exposure to it produces death without warning. This is the same gas which is produced from the exhaust of an automobile, so that a car should not be kept running in a garage where the doors and windows are closed. Many persons have been overcome and have died from this cause.

Stoves that are allowed to become too hot create an excessive dryness of the air, which immediately has an unpleasant effect upon the mucous membranes of the respiratory tract. A pan of water placed upon the stove will greatly help to maintain the required humidity in the room. In our cities the stove has been largely superseded by a central heating plant. There are many small rooms and apartments, however, that depend upon gas, oil, or electricity.

The ordinary gas grate or gas stove, which does not consume the gas completely, should be connected with a chimney in order to carry away the products of combustion. Gas appliances should not be connected by means of rubber tubing. The tubing soon disintegrates, allowing the escape of gas, which, of course, is an immediate menace to health. The danger in the use of gas is that the flame may be blown out or may be left turned on. A decreased pressure in the mains

may cause the flame to be extinguished and thus large amounts of illuminating gas may escape. Illuminating gas often contains several per cent of carbon monoxide.

Oil stoves are used extensively by many families. The advantages are that they are portable and in a small room give the necessary heat. It is important that the wicks or burners be kept trimmed and clean, in order to secure as complete a combustion as possible. When reasonably good burning takes place, the products consist of little else than carbon dioxide and water. When the combustion of the oil is complete, and the ventilation is sufficient for respiration, the use of oil stoves does not seem to be detrimental.

**44. Hot-air furnaces.** When properly constructed and installed, a hot-air furnace of proper size is a good heater as well as a splendid ventilating agent. There are two sets of pipes: one to receive outdoor air, which is then warmed in the hot-air chamber surrounding the furnace, and a set of conduction pipes leading to the various rooms of the house. The air supply should not be taken from the cellar. The cold-air duct should be screened so as to prevent the entrance of dust, refuse, or vermin, and should be provided with a damper by which to regulate the supply of air. All joints of the furnace must be as tight as possible to prevent the combustion products from escaping from the fire box or smoke pipe into the air chamber.

One of the defects of the hot-air furnace is too small a combustion chamber. There should be an adequate amount of surface so that a large volume of air is moderately warmed. Overheating causes the air to become dry and "burned," taking the moisture from the body and its mucous membranes, which increases the liability to colds.

The location of the furnace is important. It should be so placed that the prevailing winds will assist in moving the air to the remote parts of the house. The force of the air from

the furnace is insufficient to oppose the impact of heavy winds: this results in cold rooms.

**45. Pipeless heaters.** Pipeless heaters have come into vogue. These are based on the principle that modern ventilation does not require a large supply of outdoor air to provide sufficient oxygen or to dilute the carbon dioxide. The ordinary hot-air furnace may be wasteful by warming more cold air than is needed to keep the rooms comfortable. The pipeless furnace is so constructed that cool air from the rooms is drawn into the heater and there repeatedly warmed; thus it is kept circulating throughout the house. This furnace usually has but one conduction pipe from the heater to the hall or room above. The register in the floor has two concentric flues, the outer one receiving the cool air from above, and the other transmitting the hot air from the hot-air chamber of the furnace. The hot air rises in the rooms and the cold air flows down into the heater to be rewarmed.

By means of the cracks and crevices and the openings around doors and windows there is usually a sufficient change of air for all demands of health and comfort. It is obvious that this type of heater saves fuel. To prevent the air from becoming too dry, a water pan is provided to diffuse moisture and to maintain the proper degree of humidity.

**46. Hot-water and steam heating.** The heating limit of an efficient hot-air furnace is probably about forty-five feet from the heater. In large residences and buildings it is necessary to carry heat for considerable distances from a central heating plant. Under such conditions it is more economical, convenient, and efficient to install hot water or steam.

The hot-water heater causes the water to circulate through radiators or coils placed in the various rooms, and the warming takes place partly by direct radiation and partly by convection.

Heating by steam is somewhat quicker than hot-water heating. In this case the radiators are filled with steam.

**47. Artificial ventilation.** In our schoolhouses and in other public buildings the character of the air is often determined by mechanical systems. This is known as artificial ventilation.

Artificial ventilation attempts to provide ideal living conditions by extracting air from the room (the vacuum system), or by forcing air into the building (the plenum system), or by a combination of both. The air is driven by mechanically operated fans. The disadvantages are the high cost of operation, the difficulty in maintaining proper humidity, the danger from breakdown due to accidents, and the necessity for intelligent operation. The intake and outtake must be perfectly balanced and the ducts properly arranged and placed.

The vacuum system insures the removal of impure air, and it is more easily operated and less costly, but the assurance of fresh air is not so easily maintained.

The combination of the plenum and vacuum systems, whereby air is pumped into the building and extracted by power fans, is the best mechanical ventilation yet devised.

**48. Natural ventilation.** By natural ventilation we refer to any plan of ventilation which does not involve the use of fans. Frequently it is called window ventilation. It is based on the idea that hot air, being lighter than cold air, rises while cool air settles. This brings about a mixing, or diffusion, of warm and cold air. In any room, for example, the air as it is warmed by contact with stoves, radiators, or the human body rises to the top of the room and displaces the cooler air, which falls toward the floor.

The exchange between the indoor and outdoor air is facilitated by a difference between the two temperatures. Notice, for example, how dead the air seems on a day when it is just as warm outside as it is inside. In the ordinary house some of the warmer air is constantly escaping to the out of doors through the upper spaces between doors and windows, and fresh air is filtering in through the lower parts of the same apertures.

Winds, weather, the space outside the house, the number of people in the house, and the type of heating are all factors affecting the ventilation. When there are many people in a room for a long period of time (as, for example, in a schoolroom), it is desirable to further the exchange of indoor and outdoor air by using the windows. Some, or possibly all of them, should be opened a little at the bottom and the top, but there should always be some kind of protection to those who are sitting near the windows. This may be provided by a window board or other device. One arrangement consists of a frame several inches in width, covered with gauze, and placed above the upper sash. The fresh air enters the opening between the upper and lower sashes, and the current of air is deflected upward and becomes warmed before coming in contact with the persons in the room; the frame at the top permits the foul air to escape, and at the same time prevents too rapid a loss of room heat. There are on the market several devices for window ventilation consisting of a board about ten inches in width and as long as the window is wide, which is placed so that

FIG. 19. Ideal window ventilation

Notice how the cool air may enter the room without causing discomfort by drafts. The cool air is also heated as it enters. The opening at the top of the window permits the exit of the air already in the room

the board rests on the window sill and slants inward and upward. It is held in place by an attachment at the side, permitting various degrees of slant. When the window is raised, the cool air is deflected upward by the inclination of the board, thus protecting those who are sitting near. If the deflector is made of glass, it has the added advantage of admitting light to the room.

Frequently the air becomes foul in a schoolroom where window ventilation is used. The best plan then is to open the windows and doors for a brief time so that the impurities — odor, dust, and sweepings — may be removed by force of the wind. This may be done conveniently during recess or during periods devoted to physical exercises.

**49. The controversy over natural and mechanical methods of ventilation.** Until recently it was assumed that the mechanical system of ventilation was almost ideal because it insured the pupils a constant supply of fresh air. It was assumed that the evil effects of the badly ventilated room were due to a depletion of the oxygen in the air and an increase in poisonous carbon dioxide. This theory seemed to be confirmed by investigations which showed that the normal amount of carbon dioxide in fresh air increased as the air became foul. The test of "good air" therefore became a test for carbon dioxide. It was generally agreed that more than .06 per cent of carbon dioxide indicated "bad air." Later it was discovered that the carbon dioxide might under certain conditions be increased to 1 per cent without producing any symptoms of distress or discomfort. There began to be a suspicion that the warmth and moisture thrown off by the body might be factors in producing the symptoms associated with bad ventilation. Interesting experiments were devised. A volunteer was confined in a chamber practically air-tight. The air became very foul and the confined person began to show signs of illness. Fresh air was then piped in so that the subject could breathe

fresh air, although the body was surrounded by bad air. There was no relief. When air of the same temperature and humidity and containing the same amount of oxygen and carbon dioxide as the air in the chamber was admitted, there was still no relief. When an electric fan was started, he at once felt relieved. Then air with low oxygen and high carbon-dioxide content but of low temperature and humidity was admitted. There was now immediate relief. Such experiments showed that good air is largely independent of its chemical content. The symptoms associated with bad ventilation are not due to the character of the air we breathe but to the character of the air surrounding the body. So-called bad air if sufficiently dried, cooled, and set in motion leads to the disappearance of nausea and headache, so common in an unventilated room, the desire for work returns, and one may conclude that the air is good.

There is now a new and adequate explanation for the symptoms associated with bad ventilation. When there are a number of people in a room, each one is heating the room. The humidity is increased by the evaporation of perspiration and by the moisture content of the breath. Soon the air becomes so hot and moist that it is saturated. Then the symptoms of physical discomfort appear.

Recent experiments in schoolroom ventilation, notably that of the New York State Commission on Ventilation, confirm the facts indicated above. Their studies indicate that open-window ventilation with an outlet for air through gravity ducts is most satisfactory. This type of ventilation not only gave greater comfort but seemed to decrease the amount of respiratory disease among the children. An experiment conducted by the Bureau of Child Hygiene, Department of Health, New York City, shows that in those classrooms having mechanical ventilation the rate of respiratory disease among the pupils was 98 per cent higher than in open-window classrooms.

The controversy over artificial versus natural methods of ventilation continues. The artificial or mechanical method is expensive to install, but in some states old laws make its continued use necessary.

**50. Life in the open air.** Whatever type of ventilation is adopted for home or public buildings, it is evident that nothing can take the place of living as much as possible in the open air. This has been found to be true in the treatment of many diseases, notably tuberculosis. There are no diseases due to the air alone. Air becomes dangerous only when it carries droplets from the respiratory tract of infected individuals close at hand or when it contains injurious dust. Probably one reason for the superiority of outdoor air is the health-producing effect of sunshine, which is antiseptic, cures bone and skin diseases, and increases the number of white corpuscles and the amount of hæmoglobin. It was Pliny who said long ago, "Sol est remediorum maximum." In the light of modern science he spoke better than he knew.

### *For Informal Discussion in Class and at Home*

1. Why is it that one feels better on a cool, crisp morning and just the opposite on a hot, humid day?

2. Try this: Place a clean handkerchief on the window sill of your bedroom at night. Look at it on arising in the morning. Is there any difference in the appearance as regards dust? What conclusions do you make in respect to the prevalence of dust? its avoidance? its removal?

3. Why are dust and impurities in the air detrimental to good health? In your opinion what is the best way to remove dust from the home or the classroom? Can you give an instance where this is thoroughly carried out?

4. What principles must underlie the proper ventilation of a classroom? How do you ventilate your own bedroom? Explain why you think you are correct in your plan.

# CHAPTER V

## THE POWER OF SELF-CONTROL

**51. Success dependent on control.** As students we are naturally interested in what it means to be educated. Many years ago a famous English scientist said that a man might be said to have "a liberal education who has been so trained in youth that his body is the ready servant of his will and does with ease and pleasure all the work that, as a mechanism, it is capable of." Although education as we think of it today means much more than this, every thoughtful person would probably agree that Huxley stated one of the essentials of education.

Life is largely a matter of control. We have already discovered that our minds are always active while we are awake. If we could stop thinking, we should go to sleep. Although we cannot stop thinking by the use of the will, we know that we have a certain power of controlling our attention. For example, you have the power to attend to the words on this page, or your mind may busy itself with ideas concerning the party you will go to this evening or the basket-ball game of last night. The control of your attention determines whether you will select a classical course or take part in the debating contest. It is the vital element in every decision. You have a certain control of your mind.

Although the control of the mind is important, attention and will are ineffective unless they can express themselves through the muscles. This is true of even the petty decisions of life. If you decide to study your history lesson, notice that you bring into play various muscles. Notice how you turn your head and eyes to the top of your desk, how your hand goes out to lift the cover and to explore the interior of the

desk to bring forth the right book. As you get the book and put it before you, notice also how your back may bend and how you adjust the book to your eyes. This simple effort brings into play several sets of muscles. There are some things that you cannot do even if you will it unless you have been trained. Without such training you cannot play the clarinet or ski gracefully down the mountain side.

No matter what you may wish to do in the world, your ability to control your own mind and muscles must be the basis of your success. When you are able to meet the different problems of life successfully as they come up, you are said to adapt or adjust yourself.

**52. Knowledge dependent on the sense organs.** To be able to adapt ourselves to the world in which we live, we need to know something about that world. We could not get this knowledge without our sense organs. Our eyes and ears provide us with sight and hearing. Through the skin we get sensations of touch, warmth, cold, and pain. The tongue allows us to taste; the nose, to smell. Tiny organs in the muscles and tendons give us sensations of strain and weight. Dizziness, nausea, fatigue, thirst, hunger, and other sensations are the results of the function of sense organs.

Our sense organs as a whole are pouring in upon us messages which tell us about our immediate surroundings and our own body. In this way we are informed that an automobile is coming down the street, that our soup is hot, or that we are hungry and in need of food. The proper working of these sense organs, especially the eye and ear (see Chapters XV and XVI), is an important factor in control. The automobilist with poor vision, for example, is in danger of injuring himself or others.

The sense organs are often called the receptors, since they receive the stimulations such as light, sound, and pressure. The muscles and glands are effectors, because they bring about the results, or effects, of the impressions which come through

the senses. In peeling onions we may get sensations of pain located in the eyes. Tears are secreted so as to protect the eyes, and we may also wink the eyes to get relief.

**53. How the nervous system connects sense organs, muscles, and glands.** Our study of the mechanism of control so far tells us only of the end parts of the machine, of the receptors and effectors. It is as incomplete as our understanding of the telephone would be if we were familiar only with the receiver and the transmitter. Between these two, as we well know, are connecting wires and switchboards. In a similar way, between the receptors and effectors are many connecting fibers and organs, which make up the nervous system. These connections make it possible for us to act on the experiences we have. We see the ball coming and jump to catch it, or we smell the food and the salivary glands start to manufacture saliva in preparation for the food. We are responding all the time to the world of things and people.

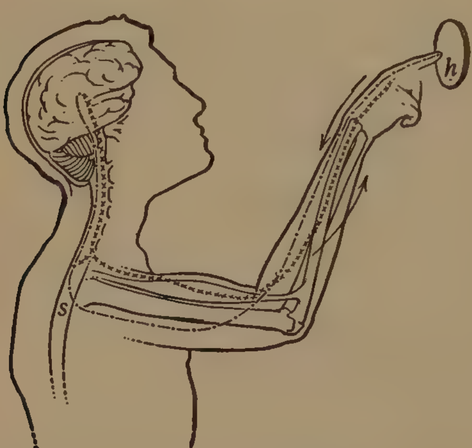



FIG. 20. How a sensation is turned into action

The nervous system is composed of many tiny cells, or neurones. They may be divided into three groups: (*a*) the sensory neurones, which lead from the sense organs; (*b*) the motor neurones, which lead to the muscles and glands; and (*c*) the associative neurones, which connect the sensory neurones with the motor neurones. It is by the successive stimulation of members of these three groups that a sensation produces an action.

**54. How a sensation is turned into action.** The actual route which a sensation may take is complicated, but by Fig. 20 we get a general idea of what may happen. Let us suppose you touch something very hot with your finger. The stimulation of heat occurs at *h*, where a nerve ending is located in the skin. The stimulus travels along to the *spinal cord s*. There it is diverted by an association neurone to a motor neurone, thence

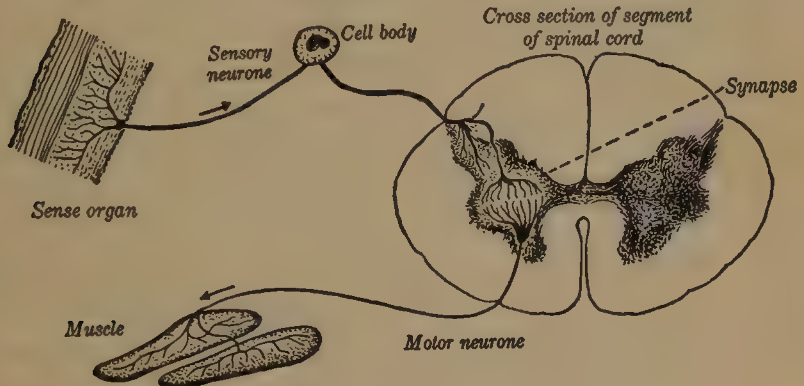



FIG. 21. The principle of reflex action

One of the simplest routes from a sense organ to a muscle. Notice particularly the point marked Synapse

to the muscle of the hand, which is withdrawn; or the stimulus may travel on through *s* to the *brain*, where thought occurs; the stimulus will then descend through motor neurones to the muscle of the hand and the hand will be withdrawn.

The route which a stimulus will take depends on circumstances. If the object touched is very hot the impulse will not travel to the brain but will take a short cut through the spinal cord to the muscles. This is a typical example of a reflex act. Such an act would be unconscious. If the impulse travels to the brain we are likely to be conscious and use our will.

**55. Central offices in the nervous system.** The machinery for mental and bodily control is similar to a telephone system. How complicated it would be if it were necessary to have a

wire from your house directly to everybody you wished to reach on the telephone! Not only would it be complicated, but bungling and expensive. These difficulties are overcome through a central office, where the operator may connect your wire with that of the person you wish to reach. The nervous system does not have such an operator, but it does have central offices, such as the spinal cord and the brain, where connections are made. In these central organs of the nervous system there is a generous supply of association neurones, or adjustors. Although not always in action in a response, in most involved acts they are at work. Look at Fig. 22; notice that an impulse passing over the sensory neurone to the association neurone might then pass into one or any number of the six motor neurones shown.


FIG. 22. A view of the spinal cord showing the three different kinds of neurones

Notice how a stimulus starting with the sensory neurone *S* might travel to one or more of the six motor neurones *M* through an association neurone *A*

**56. Connections made at the synapses.** There are millions of neurones in the nervous system, but each one is distinct from every other. They do not actually unite, or fuse: they are independent units, with their fibers coming into close proximity to each other like the branches of trees which intertwine. The nerve impulse which starts at a sense organ travels along to the place where the fibers of the neurones are close together and in some way jumps across to another neurone, and after a number of adventures of this sort finally reaches a muscle or gland. If the resistance is great at one of these points, or synapses, it will travel across at a point where the resistance is low. Just why there should be a greater resistance at some synapses than at others is one of the in-

teresting problems of psychology. Some paths seem to be preferred because of heredity. Thus when a bit of dust gets into the eye we naturally close the eye. The responses which are made without learning are usually referred to as reflexes or instincts. The reflexes are simple responses; the instincts are more complicated, as in the case of a bird building its nest.

Students of the nervous system and the mind believe that the important part of the learning process occurs at these synapses. Habits are the result, for example, of using the same connection over and over. If you brush your teeth with regularity the synaptic connections involved lose their power of resistance in large measure, and finally the brushing is performed with perfect ease and with little consciousness.

From what has been said it is easy to believe that we should make our nervous system our friend and not our enemy.

**57. The main divisions of the nervous system.** The nervous system may be divided into two systems: (1) the cerebrospinal and (2) the autonomic. The cerebrospinal system comprises the brain, the spinal cord, and also the nerves which lead into them from the sense organs and out of them to the muscles. The autonomic system is composed of a chain of nerves running along both sides of the spinal column and other nerves scattered throughout the head and body. Our conscious and voluntary acts are controlled largely by the cerebrospinal system. The autonomic system is responsible for those muscular and glandular activities of the body which are carried on without our conscious direction. The control of the heart, lungs, organs of digestion, and other internal organs is closely associated with the autonomic system. The cerebrospinal system and the autonomic system are not independent of each other, and both of them are important in maintaining good health. Let us consider the cerebrospinal system first.

**58. The spinal cord.** This important organ appears in a canal hollowed out of the vertebræ, or backbone. It is pro-

tected not only by its bony walls but also by tough membranes and fatty tissue. A cross section of it would show that it is gray within and white on the outside. The gray matter is made up of the nerve cells; the white matter is composed of nerve fibers. The white fibers conduct nerve impulses up and down the cord. The central gray matter serves as numerous relay stations from which the nerve impulses may leave the cord and be conveyed by nerves to different parts of the body. The spinal cord gives off thirty-one pairs of spinal nerves, or, in general, one pair for each vertebra. The spinal cord has two definite functions. First, it is a center for reflex action; switching stations are found in various parts of the cord. Secondly, it conducts nerve impulses to the brain.


FIG. 23. The cerebrospinal system, which controls conscious processes and voluntary acts

The upper part of the spinal cord is enlarged and is called the medulla oblongata, or bulb. Like the remainder of the spinal cord, it conducts nerve impulses to the brain and also serves as an organ of reflex and automatic action. Its centers are simple, reflex, and automatic. It is the central controlling station for simple reflex acts such as are concerned with mastication, closing of the eyelids, vomiting, sneezing, and coughing. The medulla also has very important automatic centers that regulate the activity of the heart, control the work of the respiratory organs, and help to determine the size of the blood vessels.

**59. The brain.** The most important and complicated part of the nervous system is the brain. The spinal cord can act only

on impulses as they are received: it cannot originate impulses. The brain can originate impulses which are not the effect, at least not the immediate effect, of stimuli from the outer world. Although the brain thus seems to be spontaneous, probably in


FIG. 24. The brain, showing various centers of consciousness

many cases its acts are the result of memories of impulses previously received. The brain not only causes action and directs the cord in the case of the use of the will, but it may also restrain the cells of the cord from sending out impulses when strong stimuli are received from the outside world. This power on the part of the brain is called inhibition. It is

through this inhibitory power of the brain that we have self-control. The nervous person who jumps at the least noise is one whose brain is not exerting good control.

The brain is contained in the cranium, or skull. This is made of many bones cleverly dovetailed together. The arched form of the skull is the best shape for resisting blows and pressure. Its bones are so hard and firm that bullets sometimes glance from it. The delicate brain is well protected within. It is covered by three membranes, and between the brain and the bones of the skull there is a watery fluid which protects the brain from blows and jars. Unlike the spinal cord, the brain has gray matter on the outside and white matter within. The gray matter is called the cortex. Its many folds are known as convolutions.

There are two brains: the cerebrum and the cerebellum. The cerebrum, or large brain, is divided into parts or hemispheres. On the surface of the cerebrum it is possible to distinguish (1) sensory regions, (2) motor regions, and (3) association regions. This means that some areas receive impulses originating in the sense organs, others send impulses to the muscles or glands, and other areas connect the various regions. Students of the structure of the brain have discovered different centers of different kinds of work, such as the speech, visual, and olfactory centers. The cerebrum is the seat of the intellect. Consciousness, reason, memory, and imagination all reside in the cerebrum.

The cerebellum, or small brain, is at the base of the skull behind. We have discovered much about the work of this organ through experiments on animals and through our knowledge of disease. Disease of the cerebellum may result in dizziness and a staggering, reeling gait. It is believed that the cerebellum aids the cerebrum in controlling the muscles. It brings about the proper coördinating, or working together, of the various muscles in activities such as walking and running.

The medulla oblongata and parts above it give off twelve nerves on each side of the head, known as the cranial nerves. Among them are the olfactory nerve, or nerve of smell, and the optic nerve, or nerve of sight.

**60. Autonomic nervous system.** This division of the nervous system got its name because it was supposed to be independent of the cerebrospinal system. Like the cerebrospinal system, it is composed of groups of nerves which are similar in structure to those in the brain and spinal cord. Although generally beyond the control of consciousness, it is connected with the cerebrospinal system at various points. The motor nerves of this system are connected with the smooth or involuntary muscles. These nerves receive their impulses from ganglia, or groups of nerve cells distributed along the spinal

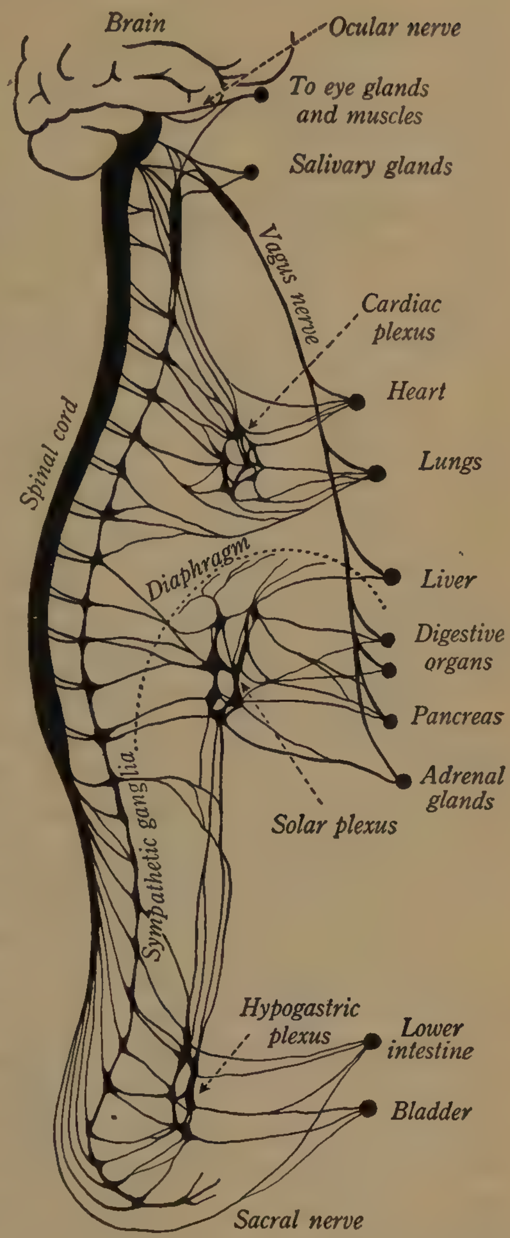



FIG. 25. The autonomic nervous system

Unlike the cerebrospinal system it has no control of our conscious acts

cord. Large masses of nerve tissue receive the name of plexus. Thus we have the solar plexus, which has to do with the digestion. It is through the autonomic system that digestion, respiration, and circulation are carried on. The autonomic system is always involved in emotion.

**61. Harmony dependent on the nervous system.** If you have ever listened to an orchestra playing, you know how important it is that the members should all work together. To produce the right musical effect each instrument must make the right contribution. Every player may be an excellent performer when he plays alone, but he cannot be a worthy member of an orchestra unless he keeps in time with the others. He must know what his part is and play it. Notice, for example, the man who plays the kettledrum. During a large part of the rendition of a Beethoven selection this man seems to be sitting back in his seat enjoying the music without any thought of doing anything. Then, at just the right moment, he adds a few drumbeats so as to round out an artistic performance. When the wind instruments come in they must not play so loud that the string instruments cannot be heard. What or who is it that brings out this necessary coördination to produce the artistic effect? It is the conductor. It is he who gives the commands and guides the individual players. In the human body it is the nervous system that exercises such control over the muscles and glands and makes the various parts of the body work together.

**62. The health of the nervous system.** Since the nervous system is the boss of the body, it behooves each of us to take proper care of it. Each of the nerve cells, like every other cell, needs oxygen and food and needs to get rid of waste products. If the boss is not in good health he loses his control, and disaster results. Good food, fresh air, sunshine, sleep, rest, avoidance of alcohol and drugs, and all the other factors contributing to good health help the nervous system. It is only

as we provide the things necessary for good health that we can give our brain cells a chance to do their work. The health of the nervous system also depends on good mental habits, such as attending to the present situation, avoiding worry, and the like. That phase of the care of the nervous system is sometimes called mental hygiene, to which we now turn.

***For Informal Discussion in Class and at Home***

**1.** Give a number of illustrations to show that successful living depends on control of our energies.

**2.** Why are the sense organs so important? Which of the sense organs are most important? Why?

**3.** Compare the nervous system to a telephone system.

**4.** What are the functions of the main divisions of the central nervous system?

**5.** How can we keep the nervous system healthy?

**6.** Under what conditions do you notice that you have less self-control? How can we live so as to have a high degree of control?

**7.** Make an outline of this chapter.

**8.** N. B. is very irritable, has outbursts of violent temper, and weeps easily. N. B. also has a finicky appetite and often avoids other people. What should you suggest as to possible causes? How might these tendencies be overcome by hygienic living?

# CHAPTER VI

## A HEALTHY MIND

**63. The meaning of mental health.** When we think of health we are likely to think of it in purely physical terms, such as strength of muscle or freedom from disease. While it is true that being physically fit is in every way worth while, it is also true that this is not all of health. This was well illustrated in the World War. The men who were finally accepted for service passed the most strenuous examinations, and yet many of them broke down mentally in the face of the impending crisis. Before they left the training camps in America, or even in France before they had heard the rumbling of the artillery or the crack of rifles, they became incapacitated for service. Sometimes they became blind or paralyzed, or they found themselves unable to sleep or were tortured by hideous dreams; yet the most thorough physical examination failed to show anything wrong. In many cases the trouble proved to be entirely mental. Under proper treatment many of these men recovered and took their places in the ranks or returned in a normal condition to civil life. It was proved that what these men needed was not so much medicine as *reëducation.* They had never learned proper mental habits, how to meet real difficulties in life. In civil life this lack of training in meeting difficulties frequently results in what we call nervousness and nervous breakdown.

It was Ella Wheeler Wilcox who wrote about the ease of being pleasant when life went by like a song, but that the worth of a man lay in his courage to smile "when everything goes dead wrong."

When everything progresses without difficulty, there is no problem in being successful; but when something is hard, those who have not been schooled in meeting difficulties find some way of avoiding them. Sometimes an illness, such as a headache, that seems to be purely physical is assumed by the individual to escape something distasteful. This is done

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FIG. 26. Service above self

These boy scouts are making their camp clean and neat. They are gaining self-reliance and learning how to be helpful in the world — two excellent habits for happy and successful living

quite unconsciously. Illness in this way sometimes seems to pay. Unconsciously it brings certain satisfactions. To the boy or girl who dreads to make a speech, a severe headache, for example, might be quite welcome. After one has avoided difficulties in this way many times it gets to be habitual.

The person who is mentally healthy meets life more directly and triumphantly. There are at least three things that mark the person who is mentally healthy. *First, he is able to meet*

*the problems of life, whether of work or play, with a fair degree of success. Secondly, he is able to do this with a minimum amount of strain, such as fatigue and worry. Thirdly, his interest in life is keen. Living seems worth while and is satisfying. It brings mental serenity, contentment, and happiness.* The person who is mentally healthy is able to look the world in the face confidently without fear and without reproach.

**64. How to maintain mental health.** To gain mental health or to improve one's mental health, there must first be a willingness to put oneself in training. There is no easy and royal road leading to mental health. It is a pearl of great price that can be won only by exerting will power and application. It should be remembered that mental health is never perfect, any more than physical health is. It is something in which we should improve day by day. The following suggestions should prove helpful to everybody:

1. *Keep physically fit.* A healthy mind depends on a healthy brain. The brain is a physical organ. Its cells must be supplied with oxygen and nourishment through the blood. It is dependent on the general physical condition of the body. What a change takes place in people's minds when they are fatigued or ill! Often they are depressed or irritable. On the other hand, a person in good physical condition is likely to face his problems with confidence. He may welcome difficulties. It has been well said that the difference between the optimist and the pessimist is a difference in digestion. The dyspeptic finds it impossible to take a hopeful view of life. Since the brain is a part of the physical body and dependent upon it, in order to attain mental vigor we should practice all the rules of healthful living referred to in these pages.

2. *Learn to know thyself.* This saying had its origin among the ancient Greeks, and is one of the essentials of happy living. One should observe his physical and mental limitations and then seek to do those things that will bring him success. It

would be foolish for one with a valvular heart trouble to think of becoming a champion sprinter or a mountain climber. It would be equally absurd for one who has no natural ability in mathematics to expect to become a skillful mechanical engineer. Much of the keen disappointment and unhappiness in life results from people trying to do what is impossible for them.

3. *Accept the inevitable.* The desire and will to do things is admirable. It accomplishes much; but there are certain situations in life that cannot be changed, and the better way is to accept them as inevitable. Frequently when people run up against a stone wall they become furious and storm against such fate. "It's just my luck!" is a common expression. They forget that everybody in life comes in contact with the inevitable. The weather, for example, is one of those things over which man has no control. It is decidedly annoying to have it rain hard the afternoon that one wishes to go to an out-of-door picnic. Yet it is fruitless to fret about it. It simply wastes mental and physical energy. A better way would be to accept the situation and decide to do the very best thing under the circumstances. Some people when they are ill refuse to recognize the situation. They may suggest to themselves that they are not ill. Ordinarily this is a poor way to get well.

In the face of great misfortune mental health may also be won. This is possible only by doing one's best under the circumstances. Helen Keller learned this remarkable lesson. She was deprived of both sight and hearing when a little child. In describing the state of mind in which she often found herself she said: "Sometimes, it is true, a sense of isolation enfolds me like a cold mist as I sit alone and wait at life's shut gate. Beyond there is light, and music, and sweet companionship; but I may not enter. Fate, silent, pitiless, bars the way." Yet amid the silent darkness she found ways of being happy. This enabled her to exclaim, "Everything has its wonders, even darkness and silence, and I learn, whatever state I may

be in, therein to be content." In describing her enjoyment of riding a bicycle, she wrote: "Next to a leisurely walk I enjoy a 'spin' on my tandem bicycle. It is splendid to feel the wind blowing in my face and the springy motion of my iron steed. The rapid rush through the air gives me a delicious sense of strength and buoyancy, and the exercise makes my pulses dance and my heart sing." Helen Keller's life teaches us that to win mental serenity we need first of all to accept the inevitable and then to school ourselves to meet it with the highest degree of success and satisfaction. In spite of her defects she graduated from college.

4. *Learn to concentrate your mind on what you are doing.* The study of great men and women shows that one of the reasons for their success was their ability to attend without interference to the problem at hand. To allow your mind to jump from one thing to another is to waste energy.

Napoleon was an excellent example of mental concentration. One of his close companions during the Consulate says of him:

> That which particularly characterizes him is the power and persistence of his attention. He can work for eighteen hours at a stretch, it may be at one piece of work, it may be at several. No one was more wholly immersed in what he was doing, nor did anyone ever make a better distribution of his time among all the things he had to do. Never was anyone more stubborn in rejecting the occupation or the thought which was not appropriate to the hour or the day; nor was anyone ever more adroit in seizing an occupation or a thought when the right moment had come.

Yet it was this same Napoleon who rested and slept with the same abandon. On the battlefield he would sometimes lie down on a blanket and sleep for a half hour and then arise, ready to go on with his work.

Napoleon was doubtless a genius in his power to concentrate his attention upon the subject at hand, but everybody may

cultivate this power to some extent. In studying, for example, one may clear his desk of everything except that which relates to the problem at hand, avoid all interruptions, and repel every temptation to let the mind wander. Concentration, like every other habit, comes through practice.

5. *Avoid worry.* It is probably too much to expect that worry can be entirely banished, but it is a bad habit of mind that to a great degree can be changed. Sometimes we are likely to worry about something that has happened. We are distressed because we think we might have done better. There is an old Chinese proverb which says: "The legs of the duck are short; the legs of the stork are long. You cannot make the legs of the duck longer, neither can you make the legs of the stork shorter." In other words, we are again facing the inevitable. It is really a silly thing to exhaust ourselves by worry about the thing that cannot now be helped or changed. Everybody has control over his own mind to a great degree. He can turn his attention from that which is troublesome to something else and forget his annoyance.

Much worry is caused by thoughts about the future. One may worry about an examination, about being ill, or about making a speech in public. In such situations there are certain things over which one will have no control. It is absurd to worry about those. One should study those aspects of the problem over which one has control, make a plan, and carry it out. As soon as an attempt is made to carry out a plan, worry tends to cease. Everybody should train himself to be content with his best. As a rule, 90 per cent of what one fears will happen never happens.

6. *Cultivate cheerfulness.* Some people seem to be naturally cheerful. Apparently they inherited a cheerful disposition. It is difficult to know just how much of this may be attributed to heredity, but it is certain that we may all cultivate cheerfulness. A good physical condition, as we know, contributes to

a cheerful outlook on life. This is well illustrated in the practice of a shrewd business man who refuses to talk with his prospective customer until after dinner. As a result of a good meal and a flow of agreeable conversation he then finds him in a more receptive state of mind. Keeping physically fit tends to make one cheerful.

One may also direct his mind into channels that are pleasant. It is a good habit to read inspiring books, to choose optimistic friends, and to seek refined and helpful recreation.

7. *Work hard, play hard, and do nothing when you rest.* One of the greatest satisfactions of life springs from work well done. Elbert Hubbard said, "Get your happiness out of your work or you will never know what happiness is." Although much is said about the dreariness of work, those who have won happiness in life have invariably found that work was one of its sources. Out of such an experience Angela Morgan could write:

> Thank God for a world where none may shirk.
> Thank God for the glorious splendor of work.

To get the most out of our work and get time for play and rest, it is desirable to concentrate our attention upon our work. Probably almost every student by diligent application to his lessons could do them more quickly and have more opportunity for recreation and rest. This mental habit is one of the most valuable that can be cultivated.

It is equally worth while to be able to "let go" of one's work, to forget all about it so far as possible when one plays. By so doing, that part of the brain used in work is given a rest, so that on returning to the task the mind may again take up work with vigor and some degree of enthusiasm. Everybody should have a certain part of the day for recreation. Outdoor sports and pastimes are best. It is a good plan to cultivate some kind of hobby which will take one out of doors and which will so enlist one's interests that work may be forgotten.

In addition to periods of vigorous work and play, there should be hours enough of rest and sleep. When one has been under considerable pressure it is a good plan to rest, even if it be for only a few minutes. The most complete rest is to be had by relaxing both body and mind. So far as possible one

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FIG. 27. Wholesome recreation makes for mental health

The children of this neighborhood are having some fun in this orchestra which they have organized and are conducting themselves

should try to go to sleep as soon as one goes to bed. It is a bad habit to run over the events of the day and plan for the next day before going to sleep. By vigorous work, by play, and by complete relaxation, both body and mind can be kept in good condition.

8. *Learn self-control.* Emotion plays an important part in life; but a powerful emotion is likely to paralyze the intellect and cause behavior not conducive to the welfare of the

individual. Nearly everybody has done something under the influence of anger which he regretted afterwards. It is not wise to act under such circumstances. A better plan would be to count one hundred before acting, or possibly to wait until the next day. A similar method might be followed in the case of other powerful emotions. It should be remembered that self-control is gained by continued training. Like any other habit, it becomes stronger every time we exercise it and weaker with every exception.

9. *Cultivate generosity.* We are apt to associate generosity with the giving of money, but that is only one form of generosity. It also means the giving of self — helping others along the way. Generosity enriches the soul and adds to the joy of living; stinginess prevents mental growth.

10. *Cultivate friendships.* To have friends is to have relationships that make life worth while. Friendships can be formed only by coming in contact with people and showing oneself friendly. To learn how to get along with people is one of the most important things in education, vastly more important than mastering any of the academic subjects. Without this power success is largely impossible. Drawing away from the society of others and spending time in solitude may be desirable at times for thought and study, but it is a tendency not to be encouraged. It tends to make one sensitive. One should seek associations with others, and friendships. Today such organizations as the Boy Scouts and Girl Scouts and other clubs and organizations make it possible to develop friendships with ease if one is willing to make a little effort.

11. *Make your daydreams work.* We all get a certain amount of enjoyment from our daydreams. Frequently in our daydreams we seek to satisfy those desires that are not gratified in actual life. In our daydreams we are always popular, we have many friends, and we accomplish great achievements on the concert stage, in the world of authorship, or in some other

field where our wishes lead us. Such dreams often rest us. From them are often developed some of the finest productions of art and literature. Yet there is a danger in such dreams. Often dreams are substituted for reality. To be a mere dreamer does not help anybody to get along in the world. The more he dreams, the farther he gets away from the real problems of life, and sometimes he becomes powerless to cope with the world of people and things. This makes him sensitive and causes mental discouragement and depression.

FIG. 28. Dreaming rather than doing

This man has let the golden opportunities of life glide by. He has the bad habit of substituting dreams for deeds

Dreams are desirable if they can be attached to the world and made to solve problems. When you day-dream try more and more to dream practical dreams. Then plan to work them out in life.

12. *Learn to do something well with your hands.* The function of the mind is to help us to adjust ourselves to the world in which we live. To deal in a satisfactory way with the world, it is necessary to use our muscles. Much of the education received in schools unfortunately concerns the getting of ideas rather than the concrete dealing with the physical world. Often it tends to make one helpless in facing the hard problems of life. While the modern school has added a good deal of work in the manual arts, most students need to supplement this by learning to do practical things with their hands outside of school. By so doing the mind is trained to deal with the world.

Handling tools, gardening, playing tennis, and other activities involving actual contact with the physical world prevent the mind from growing morbid and encourage skill in meeting life. This brings success and its accompanying satisfaction.

13. *Cultivate self-reliance.* The newborn babe is entirely dependent on its parents and surroundings for life. There is nothing more helpless in the world. Gradually he learns to walk, talk, and deal with people and things. He should grow in self-reliance until finally he becomes largely independent of others. If this self-reliance is not won, then one's growth may be delayed or even stopped. A lack of self-reliance makes it increasingly difficult to face responsibilities. Self-reliance leads to success and happiness. It can be cultivated by gradually taking on more responsibility, by really practicing self-reliance.

14. *Confide in a good friend when you are in trouble.* Mental peace is seldom found by repressing emotions. When in trouble consult your own father and mother if they are sympathetic. If not, talk over your difficulty with some teacher or good friend. It is astonishing how troubles shrink and even disappear after there has been an unburdening of the soul. Often the advice received is invaluable. But many of the less desirable emotions, such as anger, envy, suspiciousness, can be worked up to greater intensity by expressing them in words; and confiding in a friend is sometimes made a pretext for the luxury of intensifying the vicious emotion.

15. *Consult your family physician if you have fears, doubts, or strange thoughts over which you have no control.* When one runs a temperature or feels otherwise physically ill, a physician is consulted. People are not usually sensitive about doing this, but they are often reluctant about going to a doctor when their minds do not seem to be working efficiently. Sometimes they think it is a disgrace and do not want their friends to know about it. This is a foolish idea, because almost everybody

at times has mental tangles and difficulties. To have such difficulties does not mean that one is losing his mind or going insane. Troubles that one cannot solve himself should be taken to the family physician or to a specialist in mental troubles, a psychiatrist. Avoid quacks.

*For Informal Discussion in Class and at Home*

1. Consider your own mental health. What are its strong points? its weak points? How will you attempt to correct them?

2. Review James's rules for habit formation (p. 8).

3. Write out your program of an ordinary day's activities. Is your day arranged wisely for the necessary amount of work, recreation, and sleep? Pass in to your teacher your detailed program. After a conference with your teacher try to make out a better program.

4. Collect a number of incidents from the lives of great men and women which will illustrate self-reliance, self-control, and the other mental-health rules of this chapter.

5. Study the life of Napoleon to discover mental habits other than concentration. What undesirable mental-health habits led to his downfall?

6. How should one train himself to meet criticism?

## CHAPTER VII

## A HEALTHY MOUTH IS GOOD HEALTH INSURANCE

**65. Where America leads.** As Americans we are naturally proud of our country's achievements. We like to boast about our natural resources and our superiority in industry. We also believe we have the most advanced ideas on dentistry in the world. Our dental schools are second to none; we graduate more students in dentistry than any other country; many students come from foreign lands to study in our dental schools; our dentists are among the ablest. It might be said that this is the home of the dental profession. More toothbrushes to every thousand people are sold here annually than in any other country in the world. Probably American children excel all other children in brushing their teeth. These are facts that make us proud as citizens of this republic — very proud, until we know the reason why.

**66. Where America fails to lead.** One reason why America has such preëminence in this field is because she also leads the world in the prevalence of dental decay. Dr. Harold DeWitt Cross, Director of the Forsyth Dental Infirmary for Children in Boston, says that "investigation shows that 96 per cent of the children who come to this country from the southern part of Europe have sound teeth, whereas it is well known that the teeth of 96 per cent of the American children are defective." This statement is practically confirmed by every reliable authority in dentistry. Dr. William P. Cook of the Harvard Dental School says:

I have examined hundreds of mouths of school children from six to twelve years of age at the preventive dental clinic at the Harvard Dental School during the past winter. With few exceptions the teeth of these children were badly broken from decay. A comparison with children who recently arrived in this country showed very little loss of tooth tissue in the children of the Italians, Albanians, Jugoslavs, Sicilians, Austrians, or Lithuanians.

Evidently, in spite of all our dental schools and care of the teeth, we do not have as healthy mouths as people living in southern Europe. Even the Eskimos have something to teach us. They are entirely ignorant of the structure of the teeth and the knowledge of hygiene that we possess. They live under conditions that we should think far from healthful, yet they have almost no trouble with dental decay.

**67. Why Americans have poor teeth.** The principal reason for the prevalence of decay among the American people seems to be due largely to an inferiority in our diet. The teeth are a part of the human body. The blood carries to them the materials out of which the teeth are constructed and repaired. If the right kind of food is not eaten, then the teeth must be defective and hence easily subject to decay. The relation of dental decay to nutrition is strikingly shown in severe illness. Since little food is then taken, the body must literally consume itself. It uses up its stores of fat and resorts to the various tissues of the body, including the teeth. The teeth are often so robbed of their minerals that they begin to decay. Although we live in a land of plenty we have some faulty food habits not found among the peoples living in southern Europe. Since the peoples living in northern Europe have food habits similar to our own, they share with us in having dental decay. In referring to the diet of the immigrants Dr. Cook says:

The diet of these people, except where they have come in touch with American food products, has been such as to prevent decay of the teeth: hard, dark bread, so hard it makes the jaws ache to

eat it; vegetables; fruits; dark macaroni; hard goat's cheese; some fish; not much meat; no sweets; no sweet cakes or soft crackers; no candy. Food of this character (especially if eaten at the close of the meal) leaves the mouth physiologically clean, as emphasized by Dr. J. Simm Wallace.

Compare this condition with that of the average American after a meal of our soft, sweet food. The tongue is covered with soft food; the interdental spaces are also filled with sweet, carbohydrate food. There is no exercise of the muscles made for use in mastication, as the food does not require chewing.

Our refined flour, sugar, and other food products and canned vegetables (deficient in mineral and vitamin content) have helped to build up the dental profession and medical profession as well, since the digestive disturbances caused by the food require treatment.

This is a vicious circle. The remedy is not more or better repair dentistry, but a change in dietary habits. A practical illustration is brought to our doors by these immigrants. Their wonderful tooth development will not withstand our diet. Many of them who come to America with sound teeth sacrifice them for artificial teeth after adopting our diet.

Before discussing the measures we need to adopt to have a healthy mouth let us consider some of the reasons why good teeth and a healthy mouth are so important.

**68. Digestion in the mouth.** A healthy mouth is one of the first essentials of healthy living. One important reason is that here is the first step in digestion, the process of changing the food so that it can be used by the body.

Food, like coal, is a form of energy. The body is a kind of machine for extracting, so far as possible, this energy from the food and turning it into heat, motion, and thought. Since, unlike the ordinary machine, it is a living mechanism it can turn its intake of fuel into growth and repair. The eating of proper food and its digestion are therefore of vital importance for healthy living. If the initial process of digestion in the mouth is hindered, the whole process of digestion may suffer.

**69. Mastication.** In order that the food may be dissolved and changed for absorption into the body it is necessary that, first of all, it be masticated. The mouth is wonderfully constructed for this mechanical process. In the middle of this chamber is the tongue, which keeps the food between the teeth as the jaws contract and relax. The force exerted by the jaws is so great that sometimes it is equal to the person's weight.

The teeth are admirably fitted for the work of mastication. The four prominent chisel-like teeth in the front of each jaw, the incisors, cut and divide the food; the canine teeth break it up; and the bicuspids and molars grind it. It is interesting to note that the teeth of different animals vary according to their food. The carnivorous, or meat-eating, animals swallow their food with little mastication; the herbivorous break theirs into small fragments. The teeth of carnivorous animals, like the tiger, are therefore especially adapted to catching food. A herbivorous animal, such as a cow, has teeth especially constructed for grinding. Since man is omnivorous in his food habits, his teeth perform both functions.

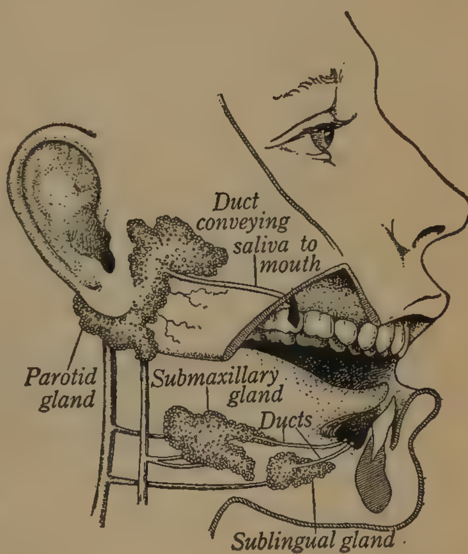


FIG. 29. When your mouth waters the three salivary glands are working

While the food is being finely subdivided and moved about in the mouth, it is being mixed with a fluid called saliva. This fluid moistens the food so that it can be readily swallowed.

**70. The salivary glands.** The saliva is manufactured by sets of glands known as the parotid, submaxillary, and sub-

lingual. The parotid gland occupies a space in front of the ear. It pours its fluid into the mouth through a duct opposite the second upper molar tooth. The submaxillary gland is located in a groove on the inner surface of the lower jaw. The sublingual, as the name indicates, is found under the tongue. All these glands have ducts through which the saliva is poured into the mouth.

The secretion of the saliva is entirely beyond the control of the will. The sight or smell of food when one is hungry will sometimes stimulate these glands to action. This accounts for the expression that a certain kind of food makes the mouth water. This flow of saliva is called the psychic, or mental, secretion. The presence of food in the mouth, arousing sensations of taste, contact, and temperature, leads to a more sustained flow.

**71. How saliva changes the food chemically.** The saliva not only helps in the swallowing of the food, but it starts a chemical change so that the food can be fitted for the body's use. This is accomplished by an enzyme or chemical ferment called *ptyalin*. This acts directly upon the starch, changing it into a kind of sugar called maltose. The maltose, however, cannot be absorbed until it is changed still further into a simpler sugar. Through the action of other enzymes in the intestine this change is made.

Animals such as the dog, that gulp down their food, have little if any ptyalin in their saliva. It is entirely lacking in fowls, since the process of subdividing the food takes place in the gizzard.

Unlike the dog and bird, man needs to chew his food thoroughly and mix it well with saliva to save the body from undue strain and to preserve health.

**72. Influence of the mouth and teeth on the general health.** Until recently the teeth were looked upon as having little relation to the work and health of the body as a whole. Now

we are beginning to realize that while it is desirable to have sound teeth to avoid pain, gain comfort, and preserve our good looks, the health of the body as a whole is vitally dependent upon sound teeth. The late Sir William Osler said that "there is no one single thing in preventive medicine that equals mouth hygiene and the preservation of the teeth." Many diseases and troubles are now known to be due to bad teeth that formerly were not suspected of having such a cause. These causes of ill health arise because of infection.

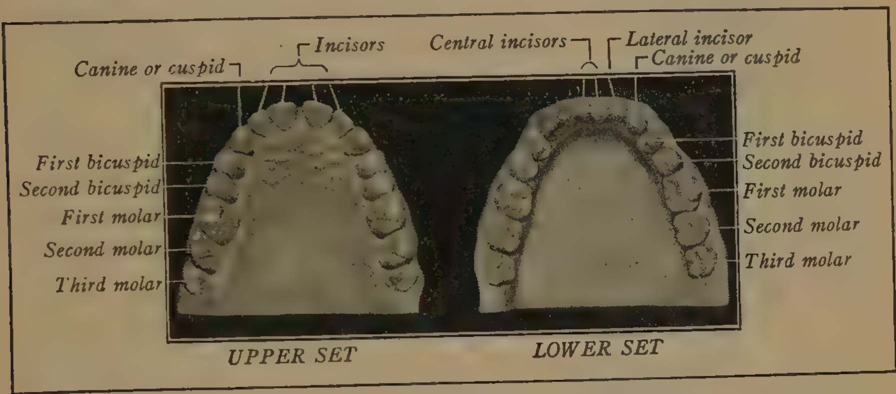



FIG. 30. A model of a perfect set of teeth

The mouth is an ideal place for growth of germs. It has warmth, moisture, and particles of food in dilution. Since food and air under even the best of conditions are likely to be contaminated, many germs find their way into the mouth, where they tend to multiply rapidly. Only a small proportion of these are disease germs. However, if they are to be rendered harmless the body must offer some kind of resistance.

Because of poor tooth structure, and other unhygienic conditions, food allowed to remain lodged between the teeth may start early decay. This decay involves the manufacture of poison, which may be swallowed along with the food and so carried to the stomach and intestines, where it may be absorbed into the blood stream. The dissemination of this

infectious material through the body may be the cause directly of such diseases as rheumatism, neuritis, and other maladies. Inflammation and suppuration of the gums and supporting membranes of the teeth may also be responsible for any of these diseases, since the infectious material may be absorbed into the blood vessels and carried through the system until lodged in some susceptible organ or tissue. All these so-called focal infections may exist for a considerable length of time without giving rise to bad symptoms; but as soon as one's resistance, or vitality, is lowered because of hard work or illness, they may attack the weakest part. Then radical measures must be resorted to, such as the extraction of the offending teeth. Sometimes these pockets of pus cannot be detected except by means of the X ray. In trying to find the cause of bodily ills many physicians now recommend that the patient first have his teeth X-rayed. Dentists are agreed that killing the nerve of a tooth before filling it is a questionable practice, since a dead tooth is often the cause of an abscess.

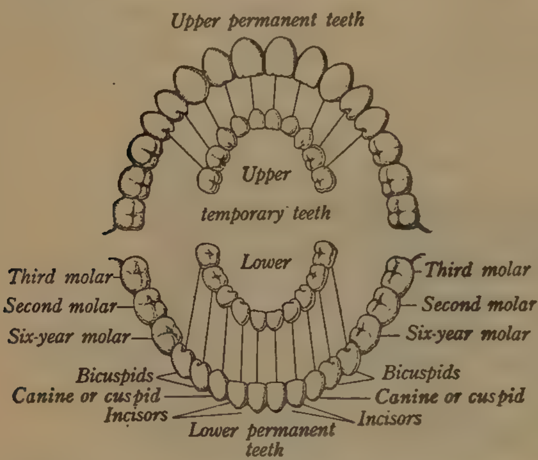



FIG. 31. The temporary and permanent sets of teeth

Notice that when the six-year molar erupts it does not succeed a temporary tooth. For this reason it is often thought to be a temporary tooth

One very prominent medical authority says that "major operations will decline 50 per cent when the majority of people have their mouths cleaned up of focal infection and when dental prophylaxis is generally accepted and adopted."

In the light of medical science a healthy mouth seems to be valuable insurance for happy, healthy living.

**73. Good teeth make for success in school.** Since the condition of the teeth plays such a part in the general health, it is to be expected that it will also affect one's power to learn in school. If a pupil suffers from toothache and is being poisoned by the results of decaying teeth, the brain cannot function as well. Dr. Herman N. Bundesen, former Commissioner of Health of the city of Chicago, reports in a weekly bulletin issued by his department in January, 1924, that in a group of twelve thousand children who had dental defects corrected by the Chicago Health Department it was found that 70.5 per cent of them improved in health, 48 per cent improved mentally, and 51 per cent improved in school attendance. Although this improvement was probably not due entirely to the care of the teeth, nobody would question that it was a factor in the improvement. This brings us to some specific recommendations on how to keep the teeth in a healthy condition.

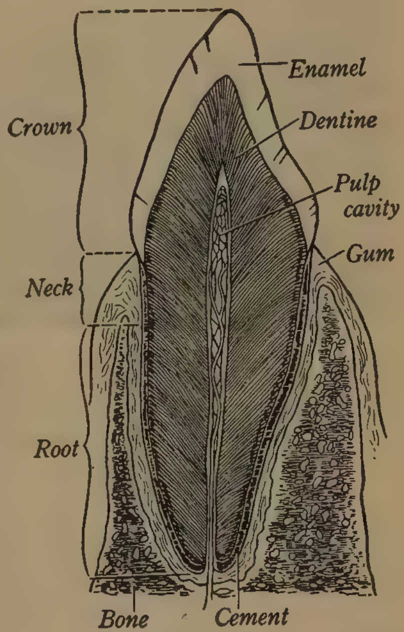



FIG. 32. A longitudinal section of a healthy tooth

The enamel is the hardest substance in the human body. The dentine and cement are much softer. The nerves and blood vessels are in the pulp cavity

**74. Keep in good general health.** Since the teeth are affected by the nutrition and general health, it is important to keep physically fit all the time. This means forming the good health habits referred to in the previous chapters of this book. Among these health habits eating the right kind of food is

especially important. Green vegetables, fruits, and coarse foods are especially desirable. One defect in our diet is to eat foods that require practically no mastication. This does not give the teeth and jaws enough exercise to keep them in a healthy condition.

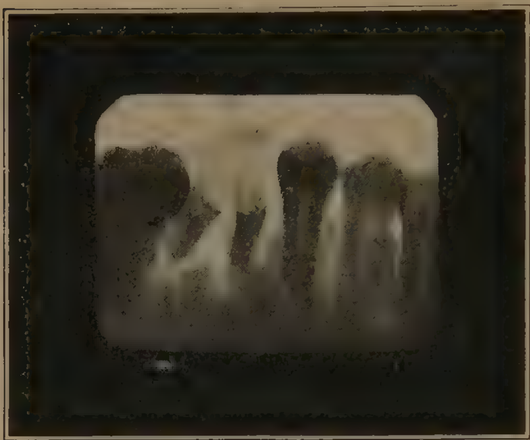


FIG. 33. An X-ray negative of the teeth

This disclosed a pocket of pus. Good dental care restored the patient to health. (Courtesy of Dr. Waldo H. Mork)

**75. Avoid an excess of sweets.** America consumes more pounds of sugar per capita than any other nation in the world. Our candy bill in 1926 was $258,251,-562. When a lady from Holland was asked about the things in America that particularly impressed her, she said: "I never cease to wonder at the large number of candy and confectionery stores. Every drug store seems to have its shelves loaded down with boxes of candy. We have nothing like that in Holland." One of our vicious habits is that of eating large quantities of candy, especially between meals. It then dulls the appetite for wholesome food. Candy is inferior as a food; a little of it can be taken at the end of the meal with profit but its unwise use leads to dental decay. When sugar is left in the mouth it turns

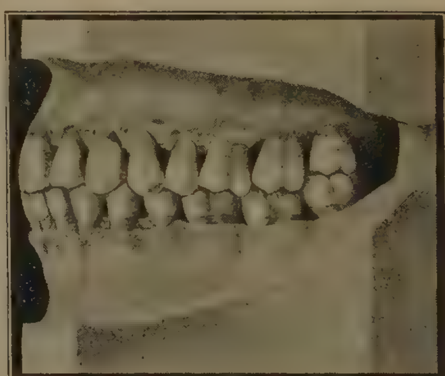


FIG. 34. The arrangement of these teeth makes good mastication easy

to acid and tends to dissolve the lime in the teeth. It also tends to encourage bacterial life in the mouth.

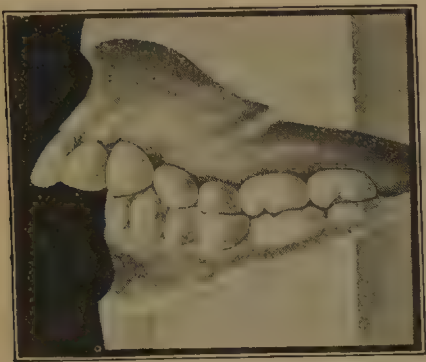


FIG. 35. The arrangement of these teeth makes mastication difficult

Such a defect could be corrected in early life. (Courtesy of Dr. J. William Maller)

**76. Choosing a toothbrush.** Most of the toothbrushes now on the market are too large for efficient brushing of the teeth. A small, fairly stiff-bristled brush is to be recommended. This enables one to reach the different parts of each tooth. The working end of a good brush should be about seven rows of bristles long (about $1\frac{1}{4}$ inches) and two or three rows wide. The groups of bristles should be rather far apart, and the bristles themselves should be of uneven length. The handle should be at least six inches long. It must be long enough to grasp securely and maintain considerable pressure.

There are many toothbrushes now on the market which are supposed to adapt themselves to the shape of the arch of the mouth. Since the arches vary (see Fig. 36), this is impossible. A brush that has had considerable popularity is one with an elongated tuft. This is not a good brush. It is not adapted for brushing the teeth on the inside and does not facilitate the

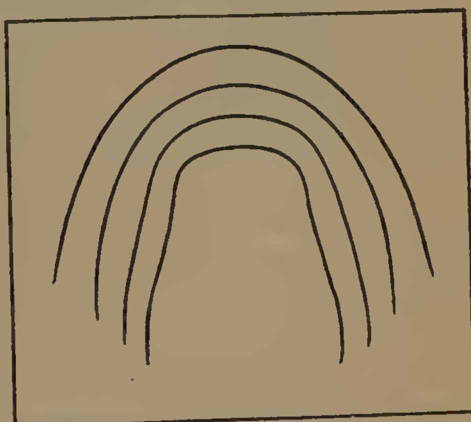


FIG. 36. A few illustrations of different kinds of dental arches

Which type is yours? Do you believe that there is any one toothbrush sold that will fit everybody's mouth? (Courtesy of *Hygeia*)

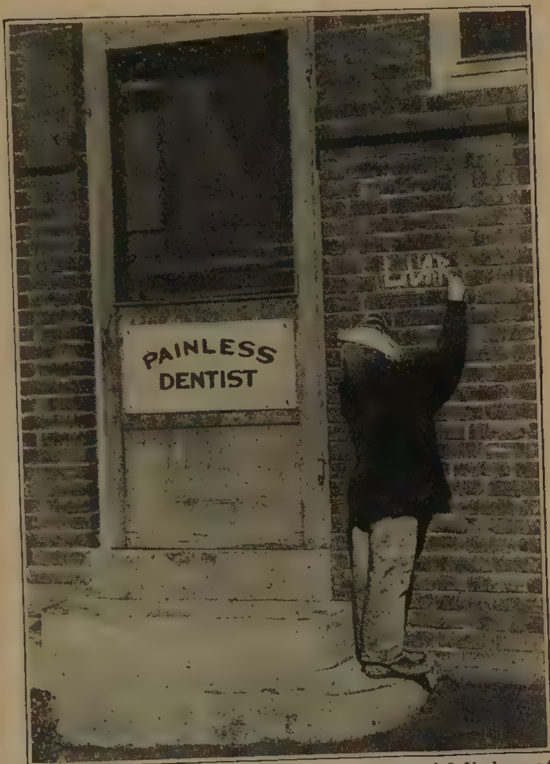
proper massage of the gums toward the tongue. As soon as the long bristles in the tuft become wet they tend to bend and slide over the teeth.

**77. The care of a toothbrush.** The proper care of a toothbrush is fully as important as the choice of a brush and its use. Many toothbrushes are soon ruined through improper care and then unfortunately often continue to be used. A new toothbrush should be placed in cold salt solution for two hours before using. This will set and clean the bristles and reduce their harshness. Hot water should not be used for brushing the teeth or rinsing the brush. The bristles become softened, and the handle changes its shape in a short time, so that it becomes unsuited for efficient brushing. A brush should always be rinsed well and the water well shaken out. If a cup or tumbler is used, the bristled end should not be kept in it. The toothbrush should not be kept in a container, since it prevents drying, destroys the bristles, and encourages the growth of bacteria. A brush should be allowed to dry for twenty-four hours after using so that it may regain its original stiffness. It is therefore desirable to have one brush for morning brushing and one for evening brushing. Many persons continue to use brushes after they have been worn out. This means inefficient use, and the loose bristles often make for serious infection, since they are liable to injure the gums.

FIG. 37. Choose a good toothbrush

Read the text to find out what kind of brush this ought to be. Do you own one? Your dentist can give you some good advice

**78. Dentifrices.** The value of toothpastes and powders has been grossly exaggerated by advertisers. A dentifrice plays a minor rôle in the care of the teeth. It has no magic power to clean, and as a cleansing agent it depends on the brush that applies it. No part of a tooth can be cleaned unless the brush actually touches it. A very careful investigation of the various toothpastes on the market shows that some of them have been presented to the public with utter ignorance of the chemical and medical principles involved or with the idea of misleading the public. A dentifrice is a mechanical aid in cleaning the teeth, but it does not cure or prevent diseased gum tissue. The statement sometimes found in advertising that a toothpaste will cure and prevent the disease of the gums known as pyorrhea is false. Since various dentifrices are pleasantly flavored, they make the brushing of the teeth a pleasanter task. Only a small amount on a brush is necessary. It is better to decrease the amount of toothpaste and spend the extra money on toothbrushes. The brush is far more important in actually cleaning the teeth.

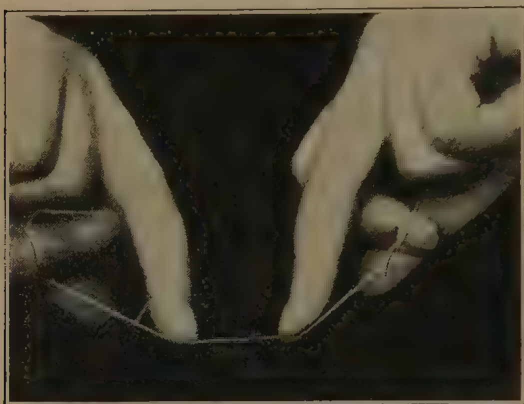



Underwood & Underwood

FIG. 38. Choose an honest dentist

The man who advertises is usually poorly trained, and a quack. Early and regular visits to a reliable dentist make dentistry painless

**79. Mouth washes.** The purpose of a mouth wash is to get rid of the particles of food that have been loosened by the brush through rinsing. Probably the cheapest and safest mouth wash is made by dissolving a half teaspoonful of salt in a glassful of warm water. A little sodium bicarbonate may be added.



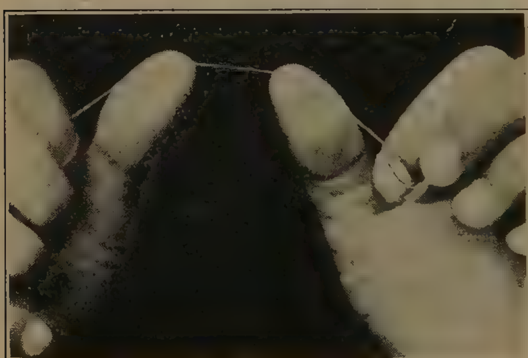


FIG. 39. The correct use of dental floss

Use it daily. (Courtesy of Dr. H. C. Fones)

The value of mouth washes has also been grossly exaggerated by advertisers, who are much more interested in making money than in promoting dental health and who are often densely ignorant of the fundamental principles of hygiene involved. No mouth wash has any effect on pyorrhea. The best preventive and cure of this malady is to consult a good dentist regularly.

Mouth washes have been highly advertised as germ killers. They might be if they were left in the mouth long enough, but in a few minutes the mouth would have a bacterial content similar to that which it had before. People are often misled by the clean, delightful feeling left in their mouths after using a commercial mouth wash. They may think that their mouths are clean. This is something like the

philosophy of the Oriental, who uses perfumes instead of soap and water. It is to be remembered that the use of dentifrices and mouth washes is largely mechanical rather than chemical or antibacterial.

**80. Toothpicks and dental floss.** The use of all types of toothpicks should be avoided. They tend to irritate and lacerate the gum tissue, thereby producing infection. When food between the teeth cannot be dislodged with a brush, dental floss may be used. It should be passed gently through the contact points so that it will not snap down on the gum and lacerate it. Usually this may be prevented by a slight back-and-forth movement of the floss. The floss is being incorrectly used if the gums bleed.

Underwood & Underwood

FIG. 40. The dental hygienist at work

Such trained assistants occupy an important place in modern dentistry

**81. Cleaning teeth regularly.** Although it is an exaggeration to say that "a clean tooth never decays," it is true that keeping the teeth clean does much to prevent decay and keep the mouth in a healthy condition. Outside of the question of health, it pays to keep the teeth clean. They improve the appearance, the breath, the complexion, and the entire physical being. It is far from pleasant to talk to a person whose mouth shows dirty, decayed, and foul-smelling teeth. That

person would find it difficult to get and keep a good position where he or she would come in contact with cultured and refined people. Good teeth are a health asset. They are more than that: they are a personal, business, and professional asset as well.

The teeth should be brushed with a toothbrush and dental cream or powder at least twice every day, once upon arising and again before going to bed at night. They should also be brushed with a brush and water after every meal. Since conditions often make this impossible, a good habit is to fill the mouth with water and then wash the teeth by forcing the water between the teeth. This will remove particles of food.

**82. How to brush the teeth.** Many methods have been devised for cleaning the teeth. The suggestions on the opposite page have been taken from a booklet entitled "Your Health and Your Teeth," issued by the Oral Hygiene Committee of Greater New York.

**83. Consult a dentist periodically.** It is a good plan to consult the dentist about every six months. He should be consulted with regularity even if there is no warning of decayed teeth. First of all, the teeth need to be cleaned periodically by the dentist or his dental hygienist, a nurse specially trained in dental prophylaxis. She now occupies an important place in modern dentistry. Even with the best of home care a hard substance called tartar will gather on the teeth. This may make the teeth unsightly in appearance and also lead to decay. Secondly, decay may start without our knowledge. If the teeth are filled immediately, there will be little or no discomfort and the expense will be slight. Many people have been saved from serious illness by consulting the dentist with regularity.

One of the latest discoveries in dental hygiene is the fact that many of the teeth of children as soon as they are erupted contain fissures — imperfections in the enamel. These teeth were not well formed during the growing period. A fissure is often

## HOW TO BRUSH THE TEETH

There is a right and a wrong way of doing anything. Numberless experiments have been made by experts to find the right way to brush teeth. The following method has been demonstrated to be scientifically correct. Practice it and use it for the most satisfactory results.

The four steps in the proper brushing of the teeth are as follows: (1) outside surfaces of teeth and gums of both upper and lower jaws; (2) inside surfaces of upper teeth and gums and roof of mouth; (3) inside surfaces of lower teeth and gums; (4) tops, or grinding surfaces, of all the teeth.

### 1. Outside Surfaces

Place the toothbrush inside the left cheek and on the upper gums and nearly close the teeth together. Make the brush go backward and downward to the lower gums, then slightly forward and upward until it has traveled a *complete circle*. The circular motion should be made rapidly, so that the gums will be stimulated and the teeth cleansed of food. Keep up this fast circular motion and brush all the teeth on the left side as well as all the front teeth.

Now brush the right side with the same circular motion, or reverse the circle if found more convenient. *Brush long enough* to stimulate the gums and cleanse the teeth thoroughly, going back and forth over all the surfaces several times.

### 2. Inside Surfaces of Upper Teeth and Roof of Mouth

With the bristles of the brush pointing upward and the end of the thumb on the back of the handle, brush the roof of the mouth and the inside gums and surfaces of the teeth with a *fast in-and-out stroke*, reaching back on the gums as far as you can go. Go back and forth across the roof of the mouth with this in-and-out stroke at least four times.

### 3. Inside Surfaces of Lower Teeth and Gums

Hold the handle of the toothbrush in your fist, with the thumb lying across the back of the handle, and brush the gums and teeth with an *in-and-out stroke*, using chiefly the tuft end, or toe, of the brush. Reach back in the mouth on the gums below the last tooth, on both sides, and brush with a *fast, light in-and-out stroke*. Tip the handle of the brush up in brushing the gums back of the lower front teeth.

### 4. Tops of Teeth, or Grinding Surfaces

Lastly, brush the teeth with an *in-and-out stroke* on the surfaces on which you chew, as the food must be removed from the grooves, or fissures, of the molars.

no larger than one bristle of a toothbrush. Brushing cannot keep it clean. When food gets into a fissure and is allowed to remain there, it starts to decay. The Massachusetts Department of Public Health says that 85 per cent of all molars come through the gums with cracks, or fissures, in the surface. The dentist may prevent decay by promptly filling the cracks. The critical ages for fissure work are at from two to three years, when the baby set is complete; at from five to seven years, when the six-year molar appears; at nine years, when the bicuspids make their appearance; and at twelve years, when the twelve-year molars appear. The prevention of decay by filling fissures might properly be called preventive dentistry.

FIG. 41. The careful dentist sterilizes his instruments

**84. What to expect of your dentist.** Since the teeth play such an important part in our general health, the choice of a dentist is of the greatest importance. Do not choose your dentist because he is a pleasant fellow or because of personal friendship, but rather because he is a graduate of a reputable dental school and a member of good standing in the local dental association. Inquire into his methods. There are some men in the dental profession who are still very negligent about the

sterilization of their instruments. The mouth is such a favorable place for the growth of microbes that unless the dentist's instruments are sterilized, they may be the means of spreading disease. To insure safety, instruments should be thoroughly immersed and boiled. It is not true, as some dentists say, that boiling hurts instruments. The dentist owes you high-grade surgical technique, which is just another word for cleanliness. This should mean clean hands, clean linen, clean equipment, and a clean office. There should be a fresh napkin for each patient and also one on the instrument bracket for every case. It is essential that instruments be boiled for five minutes after each patient.

*For Informal Discussion in Class and at Home*

1. What are the chief reasons why Americans have such poor teeth?

2. What processes of digestion take place in the mouth?

3. What are the characteristics of a good toothbrush?

4. Demonstrate a proper method of cleaning the teeth.

5. Why is it important to consult a dentist with regularity?

6. How do diseased teeth affect the general health?

7. Let every member of the class formulate a scale of health habits relating to the care of the teeth. Assign points for the various suggestions. The sum total of points should be 100. Let the class or a committee from the class discuss the different scales presented, with the idea of making from them a single scale. In this final scale what is your rating?

# CHAPTER VIII

## CHANGING FOOD TO TISSUE, PLAY, AND WORK

**85. How food makes a difference.** One of the striking and interesting things about people is the fact that they are so different. Individuals differ not only as to complexion and facial features, but also in height, weight, energy, endurance, and so on. Nationalities also differ from each other. One of the reasons for these differences is the quality and quantity of food consumed, for food makes our bodies and provides us with energy and power to do things.

**86. Lessons from the Orient.** Among the many impressions we get of the peoples of the Orient is their small stature. The Chinese, Japanese, and Filipinos are all inferior in height and weight to Americans and Europeans. We have usually explained this by heredity. Some of our most profound scholars, like Dr. McCollum of Johns Hopkins University, now believe that this difference can be explained in part by differences in food habits. Dr. McCollum says that the foods in China and other Oriental countries are not suitable for young children. Even when the amount of food consumed is sufficient, the food of both children and adults is deficient in some things that are necessary for good nutrition. This deficiency in the diet is due in large measure to the lack of milk in some Oriental countries where rice is the principal food.

This belief about the reason for the smaller stature of the Orientals seems to be borne out by certain observations and experiments. The inhabitants of northern China have a better diet and are also larger than their kinsmen to the south. At the present time there are a large number of Japanese children

born in this country of pure Japanese parentage. They have improved their diet somewhat; it is not as good as that of the average American child, yet both boys and girls are larger at all ages than are Japanese children born and reared in Japan. The logical explanation is that they are being better fed than their relatives in Japan.

Dr. McCollum fed a number of generations of rats on a diet which was slightly below the standard. This did not result in any easily observed signs of malnutrition, but the size of the rats diminished from generation to generation.

Such experiments and observations show that food habits are distinctly related to growth. As our reading continues we shall notice that muscular strength, endurance, mental alertness, and robust health are dependent in large measure on good food habits.

Before discussing these points in detail let us consider how the food may be changed so as to be used by the body.

**87. The meaning of digestion.** The human body, like every other living thing, transforms matter into energy. The food consumed may be changed into the living tissues of the body or into mental and physical activity. With few exceptions food when it is first received into the mouth is not in a condition whereby it can be transformed by the body into tissue or action. This is shown when various soluble foods are injected into the circulation. Cane sugar, for example, if introduced in this way, is promptly excreted by the kidneys as if it were a waste substance. Milk if so introduced meets a similar fate. Yet these same foods when changed in the alimentary canal, or food tract, are entirely acceptable to the cells. Digestion means the change of foodstuffs up to the time when they can be absorbed through the membranes, such as the linings of the stomach and the intestines. The changes taking place after absorbtion are called metabolism.

The purpose of digestion is to change the food so that it can

be absorbed and subsequently used by the body. This necessitates making the food soluble. There are purely mechanical processes, such as mastication, which reduce the foods to minute particles. There are also many chemical processes which split the molcules up into smaller and smaller ones. Common cane sugar must be changed into such kinds of sugar as have molecules small enough to pass through

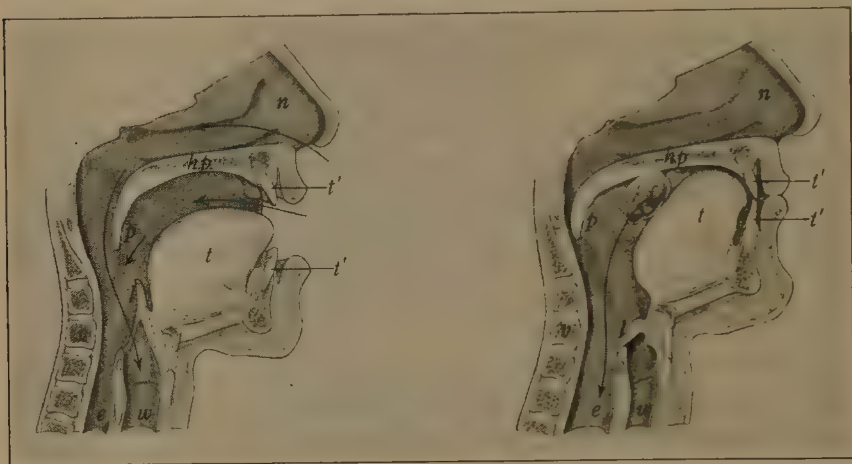



FIG. 42. Longitudinal sections of head and neck, showing air and food passages

One of these drawings illustrates the way in which air enters the windpipe; the other shows a normal process of swallowing. What are the differences? *l*, epiglottis; *hp*, hard palate; *p*, soft palate and uvula; *t*, tongue; *w*, windpipe; *e*, esophagus; *v*, vertebral column; *t'*, teeth; *n*, nose

membranes. Since starch is insoluble, it must be changed into sugar first. The more we know about the body, the more we realize that it is a remarkable laboratory where wonderful chemical changes are taking place. Some of the foodstuffs contain indigestible material. Such material must be excreted, or thrown off, as waste products by the body.

**88. Digestion in the stomach.** After the food has been masticated and has been mixed with saliva in the mouth, it is forced into a tube called the esophagus. The walls of this tube con-

tain rings of muscular tissue which contract with a wavelike motion, carrying the food to the stomach.

The stomach is an elongated muscular bag tapering down to the point where it connects with the small intestine. The larger part is called the fundus, and the tapering part the antrum. The muscular coats of the antrum are thicker than those of the fundus. The fundus is adapted for the storage of food; the antrum is capable of strong contractions necessary for the mixing of food. When the food enters the stomach a muscular band called the cardiac sphincter tends to contract so as to hold the food in the stomach. Another muscular gateway at the lower end of the stomach, the pyloric sphincter, relaxes to let the food pass into the intestine when the processes of digestion in the stomach are finished.

The lining of the stomach contains glands which pour out a fluid called the gastric juice. These glands begin to pour forth this liquid even at the sight or smell of food. Not only does the mouth tend to water at the contemplation of a meal, but the stomach also. People who because of illness find it difficult to eat, by reason of loss of appetite, may promote the digestive process by smelling and seeing food and by chewing and tasting it. Experiments show that this flow takes place only when the food seems attractive. The second flow begins after the food enters the stomach.

The gastric juice contains at least two enzymes, rennin and pepsin. Rennin causes the curdling, or coagulation, of milk. This may be of some advantage in preventing the too rapid passage of milk into the intestine. It is then slowly dissolved. The complete function of rennin is as yet not entirely understood. For a long time an extract known as rennet, usually derived from the stomach of the calf, has been used in the making of cheese.

The most important enzyme of the gastric juice is pepsin. This enzyme can operate only as the food in the stomach is

changed from an alkaline to an acid character. The gastric juice contains hydrochloric acid, which neutralizes the alkaline condition caused by the saliva. The pepsin acts entirely on the proteins, breaking up the larger molecules and thus reducing them to a form in which they are soluble in water.

Until recently it was thought that there was no digestion of fats in the stomach. It is now known that there is some slight digestion of fats due to the probable action of another enzyme, spoken of as gastric lipase, which tends to break up the fats into glycerin and fatty acids.

The fundic part of the stomach remains largely inactive, since it serves almost entirely as a reservoir for the food. The lower part of the stomach is especially active after meals. There are waves of muscular constriction preceded by waves of relaxation. These waves begin at the dividing line between the fundus and the antrum and progress from there to the sphincter of the pylorus. In the height of gastric digestion there may be as many as three of these waves in progress at one time. In its downward journey the food particles are broken up into smaller pieces and thoroughly mixed with the gastric juice. The soupy mass, called chyme, is then ejected into the small intestine. Much of the food is as yet practically undigested. It has been reduced to a liquid for the final and more important processes in the small intestine. Only a slight amount of the nutritive parts of the food has as yet been absorbed into the blood vessels.

**89. Chemical changes in the small intestine.** As the liquid chyme passes from the stomach into the small intestine it is in a condition in which it may be acted upon with ease by additional digestive juices. There are three of these: the intestinal juice, the pancreatic juice, and the bile.

The intestinal juice is manufactured by glands in the mucous lining of the small intestine. It was once thought to have no effect on digestion, but it is now known to act on

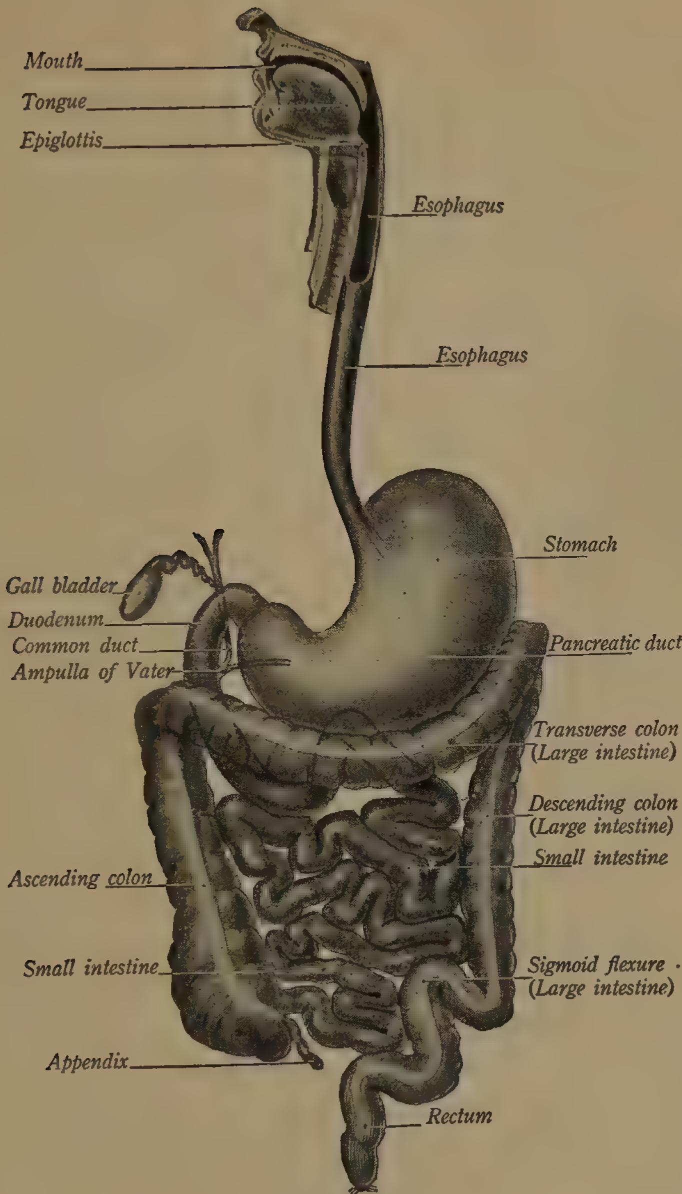



FIG. 43. The digestive system

This illustration enables one to visualize the course along which food travels in its many stages of digestion, absorption, and elimination

sugars. The intestinal juice is produced in all parts of the intestinal lining.

The pancreatic juice is produced by the pancreas, one of the most important glands in the body. It lies close to the duodenum, the first part of the small intestine. The pancreatic juice has three powerful enzymes: trypsin, amylopsin, and steapsin. Trypsin breaks up the protein molecules. Amylopsin is similar to the ptyalin of the saliva. It reduces the complex sugars to simpler forms. Steapsin acts particularly on the fats, changing them into glycerin and fatty acids. The cleavage of the larger fat globules makes the fat soluble enough to travel freely along the intestinal tract.

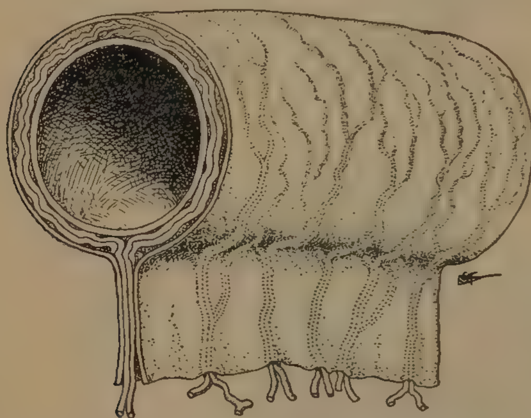


FIG. 44. The walls of the small intestine are richly supplied with blood vessels. They play an important part in the process of absorption

Besides the cells of the pancreas that manufacture the pancreatic juice, there are a number of cells that have nothing to do with this secretion but furnish an internal secretion, insulin, which is important in the metabolism of carbohydrates. The destruction of these cells is responsible for the disease known as diabetes.

The bile is secreted by the liver, the largest gland in the body. It is constantly being secreted, but is produced most actively during mealtime. The gall bladder provides a temporary storage for the bile. The bile is unique among the digestive juices in being both a secretion and an excretion. It not only assists in the digestion of food but also contains waste products.

The digestive function of the bile is rather unimportant, since it contains no enzyme. It aids the pancreas in breaking up the fats. When the bile ducts become clogged so that the bile cannot be discharged into the intestine, it finds its way into the circulation. It is then deposited in various tissues, giving a yellow effect. The condition is then known as jaundice.

**90. Absorption in the small intestine.** The small intestine is well adapted for absorption. It is a tube about the size of the thumb and about twenty feet long. Thus there is a large amount of intestinal surface that comes in contact with the food which slowly passes along. The food is propelled by peristaltic movements, or contractions of the muscular wall of the intestine. These movements are similar to the muscular contractions which pass along the esophagus in swallowing. The food travels at the rate of about an inch per minute. From four to five hours are usually required for the complete passage of a meal through the intestines.

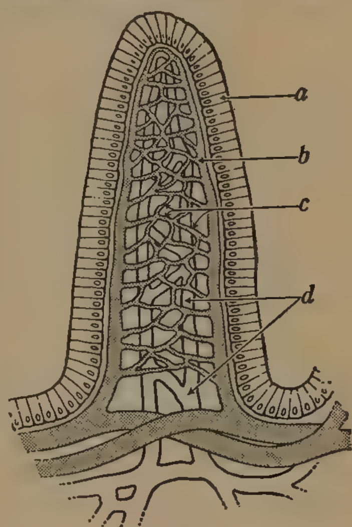



FIG. 45. A longitudinal section of a villus

*a*, layer of mucous membrane formed of cells which absorb food and carry it to the tubes within; *b*, an artery; *c*, capillaries; *d*, lacteal

One of the striking peculiarities of the small intestine is the way in which its inner surface is increased. It has many cross folds which cut into its cavity. In addition to these cross folds, the lining has many microscopic processes called villi, which dip down into the intestinal contents. The outer part of a villus is composed of a layer of cells. Within this projection, embedded in loose material, is a tangle of capillaries. In the midst of this tangle is a lymphatic called a lacteal. As the products of digestion pass into the villus they are first

exposed to absorption by the blood vessels or capillaries. That which is absorbed by the blood vessels passes through the portal vein to the liver. After circulating through the capillaries of the liver, it then enters through large veins into the right auricle of the heart. The product absorbed by the lacteals passes more directly into the right auricle through the large veins. During the process of absorption there are many chemical changes taking place which cannot be explained here. As a result of digestion and absorption the food products are now in a condition to be used by the body.

**91. The work of the large intestine.** The large intestine serves as a storage place for indigestible food products. There is almost no absorption except that of water. Bacterial action leading to fermentation and the production of poisons takes place. Unless this material is expelled daily with some regularity these poisons may be absorbed, producing headache, dizziness, and a general lack of ambition. The bad habit of failing to eliminate these wastes also tends to lower resistance against serious maladies.

*For Informal Discussion in Class and at Home*

1. What evidence have we that differences between individuals and races may be due to food?

2. What is meant by "digestion"?

3. Describe the processes of digestion in the stomach; in the small intestine; in the large intestine.

# CHAPTER IX

## EATING TO LIVE HEALTHFULLY

**92. Good food makes for long life.** Since blood, bone, brain, muscles, heart, and lungs are constructed from the food we eat, it is fair to assume that there is a relation between what we eat and the length of life.

The important place food holds in our lives, particularly with reference to longevity, is best illustrated by recent experiments with laboratory animals. It has been shown that rats fed on meat, potatoes, and white bread will live about one year. If to this diet are added milk, whole-wheat bread, and cabbage, a control group of rats will live nearly three years. When this knowledge is applied to our daily dietary regimen, who can deny that the future holds in store for us many additional years of life with comfort, happiness, and health?

If because of faulty diet an animal's life terminates prematurely, is it not reasonable to believe that many people can be made to live much longer on a wisely and scientifically selected diet? Similar experiments with animals have been made to determine the importance of restricted diets in relation to the physical condition of the offspring. It has been found that there exists a definite relationship between diet, scientifically constructed diet, and the health of offspring. This knowledge is beginning to be applied to human beings.

**93. The human body a laboratory.** The more scientists study the human body, the more they realize that it is a place where chemical reactions are constantly taking place. We speak of these reactions as metabolism.

Metabolism is divided into constructive metabolism (anabolism) and destructive metabolism (katabolism). The former comprises the processes by which substances taken as food are converted into protoplasm; katabolism is the means by which the protoplasm breaks down into simpler products, such as excretory, or waste, materials. Such phenomena enable the

FIG. 46. Pleasant hours at mealtime encourage good digestion

body to regenerate itself and to grow. To have proper metabolism is to enjoy life. It depends upon properly selected food for the individual, upon mastication, upon digestion, and upon coöperation of all the cells, the living tissues, and the organs of the body. Maintenance of health, growth, and development do not depend on how much we eat but on how much is assimilated or absorbed.

The process of metabolism is influenced somewhat by the glands of internal secretion (see Chapter X). In general our

knowledge of these glands is still imperfect. However, the thyroid gland is fairly well understood. Among other things our growth depends upon the normal functioning of this gland. It is also believed that the pituitary gland has some relation to growth.

**94. The uses of food.** Food is one of the fundamental necessities of life. In war time the food supply determines the movements of armies and the difference between victory and defeat; in times of peace the feeding of a people is directly related to its happiness and efficiency.

Food has three distinct uses. First, it is a source of heat. When it is oxidized within the body, it makes the body warm. Heat is a form of energy. The energy gained from food results in physical and mental activity. Secondly, it provides for growth. Since children grow rapidly, they need much more food in proportion to their weight than adults. A child of three needs 40 per cent as much food as an adult, although the size of the body is less than 20 per cent as great. Thirdly, food is needed to repair the body. Unlike a machine, the body repairs itself.

Thus we may say that food is any substance which when taken into the body by way of the digestive tract helps to nourish the body or serve the vital processes.

**95. The constituents of food.** The three most important constituents of food are carbohydrate, fat, and protein. In addition we must take into consideration water, the inorganic salts, the vitamins, and roughage. Other essentials to life are sunlight and air.

All three of the most important constituents have an energy factor. To understand what our energy needs are — that is, what and how much to eat — it is necessary to know something of the human machine. In the steam engine fuel is burned to produce steam, which in turn furnishes power. Our food is our fuel and, when digested and absorbed, gives the energy neces-

sary to live. In the case of food the fuel units, or heat units, are called calories and are used to designate the nutritional value of various foods. A calorie (large calorie) is the amount of heat that is required to raise the temperature of one kilogram (about one quart) of water one degree centigrade.

ENERGY VALUES OF FOOD CONSTITUENTS

| | |
|---|---|
| Carbohydrate . . . . . . . | 4.1 calories per gram |
| Protein . . . . . . . . . . | 4.1 calories per gram |
| Fat . . . . . . . . . . . | 9.3 calories per gram |

The laboring man's food-energy requirement will necessarily differ from that of a clerk or a stenographer. An adult male doing ordinary work requires 3500 calories in food-energy units daily; a woman, 0.8 of this amount, or less than 3000 calories. The amount varies with the work done. The harder the muscular effort, the greater the need for adequate food. A man employed in sedentary work needs only 2750 calories, but a man employed out of doors on strenuous work requires as much as 5500.

The energy requirements of different ages, according to Dr. H. C. Sherman, are as follows:

| AGE IN YEARS | NUMBER OF CALORIES PER POUND | APPROXIMATE NUMBER OF CALORIES |
|---|---|---|
| Under 1 | 45 | 900 |
| 1–2 | 45–40 | 1000–1100 |
| 2–5 | 40–36 | 1100–1500 |
| 6–9 | 36–32 | 1600–1900 |
| 10–13 | 34–27 | 2000–2700 |
| 14–17 | 30–32 | 2500–3400 |
| 18–25 | 25–18 | 3400–3800 |
| 30 | 2750 calories for a man of 152 pounds | |
| 40 | 2500 calories for a man of 154 pounds | |
| 60 | 2300 calories for a man of 150 pounds | |
| 70 | 2000 calories for a man of 134 pounds | |
| 80 | 1750 calories for a man of 139 pounds | |

### Height-Weight-Age Table for Boys[1]

| Height in Inches | 5 Yr. | 6 Yr. | 7 Yr. | 8 Yr. | 9 Yr. | 10 Yr. | 11 Yr. | 12 Yr. | 13 Yr. | 14 Yr. | 15 Yr. | 16 Yr. | 17 Yr. | 18 Yr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | 35 | 36 | 37 | | | | | | | | | | | |
| 40 | 37 | 38 | 39 | | | | | | | | | | | |
| 41 | 39 | 40 | 41 | | | | | | | | | | | |
| 42 | 41 | 42 | 43 | 44 | | | | | | | | | | |
| 43 | 43 | 44 | 45 | 46 | | | | | | | | | | |
| 44 | 45 | 46 | 46 | 47 | | | | | | | | | | |
| 45 | 47 | 47 | 48 | 48 | 49 | | | | | | | | | |
| 46 | 48 | 49 | 50 | 50 | 51 | | | | | | | | | |
| 47 | | 51 | 52 | 52 | 53 | 54 | | | | | | | | |
| 48 | | 53 | 54 | 55 | 55 | 56 | 57 | | | | | | | |
| 49 | | 55 | 56 | 57 | 58 | 58 | 59 | | | | | | | |
| 50 | | | 58 | 59 | 60 | 60 | 61 | 62 | | | | | | |
| 51 | | | 60 | 61 | 62 | 63 | 64 | 65 | | | | | | |
| 52 | | | 62 | 63 | 64 | 65 | 67 | 68 | | | | | | |
| 53 | | | | 66 | 67 | 68 | 69 | 70 | 71 | | | | | |
| 54 | | | | 69 | 70 | 71 | 72 | 73 | 74 | | | | | |
| 55 | | | | | 73 | 74 | 75 | 76 | 77 | 78 | | | | |
| 56 | | | | | 77 | 78 | 79 | 80 | 81 | 82 | | | | |
| 57 | | | | | | 81 | 82 | 83 | 84 | 85 | 86 | | | |
| 58 | | | | | | 84 | 85 | 86 | 87 | 88 | 90 | 91 | | |
| 59 | | | | | | 87 | 88 | 89 | 90 | 92 | 94 | 96 | 97 | |
| 60 | | | | | | 91 | 92 | 93 | 94 | 97 | 99 | 101 | 102 | |
| 61 | | | | | | | 95 | 97 | 99 | 102 | 104 | 106 | 108 | 110 |
| 62 | | | | | | | 100 | 102 | 104 | 106 | 109 | 111 | 113 | 116 |
| 63 | | | | | | | 105 | 107 | 109 | 111 | 114 | 115 | 117 | 119 |
| 64 | | | | | | | | 113 | 115 | 117 | 118 | 119 | 120 | 122 |
| 65 | | | | | | | | | 120 | 122 | 123 | 124 | 125 | 126 |
| 66 | | | | | | | | | 125 | 126 | 127 | 128 | 129 | 130 |
| 67 | | | | | | | | | 130 | 131 | 132 | 133 | 134 | 135 |
| 68 | | | | | | | | | 134 | 135 | 136 | 137 | 138 | 139 |
| 69 | | | | | | | | | 138 | 139 | 140 | 141 | 142 | 143 |
| 70 | | | | | | | | | | 142 | 144 | 145 | 146 | 147 |
| 71 | | | | | | | | | | 147 | 149 | 150 | 151 | 152 |
| 72 | | | | | | | | | | 152 | 154 | 155 | 156 | 157 |

[1] This table is used by the courtesy of Dr. Thomas D. Wood and Professor Bird T. Baldwin.

### HEIGHT-WEIGHT-AGE TABLE FOR GIRLS[1]

| HEIGHT IN INCHES | 5 YR. | 6 YR. | 7 YR. | 8 YR. | 9 YR. | 10 YR. | 11 YR. | 12 YR. | 13 YR. | 14 YR. | 15 YR. | 16 YR. | 17 YR. | 18 YR. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | 34 | 35 | 36 | | | | | | | | | | | |
| 40 | 36 | 37 | 38 | | | | | | | | | | | |
| 41 | 38 | 39 | 40 | | | | | | | | | | | |
| 42 | 40 | 41 | 42 | 43 | | | | | | | | | | |
| 43 | 42 | 42 | 43 | 44 | | | | | | | | | | |
| 44 | 44 | 45 | 45 | 46 | | | | | | | | | | |
| 45 | 46 | 47 | 47 | 48 | 49 | | | | | | | | | |
| 46 | 48 | 48 | 49 | 50 | 51 | | | | | | | | | |
| 47 | | 49 | 50 | 51 | 52 | 53 | | | | | | | | |
| 48 | | 51 | 52 | 53 | 54 | 55 | 56 | | | | | | | |
| 49 | | 53 | 54 | 55 | 56 | 57 | 58 | | | | | | | |
| 50 | | | 56 | 57 | 58 | 59 | 60 | 61 | | | | | | |
| 51 | | | 59 | 60 | 61 | 62 | 63 | 64 | | | | | | |
| 52 | | | 62 | 63 | 64 | 65 | 66 | 67 | | | | | | |
| 53 | | | | 66 | 67 | 68 | 68 | 69 | 70 | | | | | |
| 54 | | | | 68 | 69 | 70 | 71 | 72 | 73 | | | | | |
| 55 | | | | | 72 | 73 | 74 | 75 | 76 | 77 | | | | |
| 56 | | | | | 76 | 77 | 78 | 79 | 80 | 81 | | | | |
| 57 | | | | | | 81 | 82 | 83 | 84 | 85 | 86 | | | |
| 58 | | | | | | 85 | 86 | 87 | 88 | 89 | 90 | 91 | | |
| 59 | | | | | | 89 | 90 | 91 | 93 | 94 | 95 | 96 | 98 | |
| 60 | | | | | | | 94 | 95 | 97 | 99 | 100 | 102 | 104 | 106 |
| 61 | | | | | | | 99 | 101 | 102 | 104 | 106 | 108 | 109 | 111 |
| 62 | | | | | | | 104 | 106 | 107 | 109 | 111 | 113 | 114 | 115 |
| 63 | | | | | | | 109 | 111 | 112 | 113 | 115 | 117 | 118 | 119 |
| 64 | | | | | | | | 115 | 117 | 118 | 119 | 120 | 121 | 122 |
| 65 | | | | | | | | 117 | 119 | 120 | 122 | 123 | 124 | 125 |
| 66 | | | | | | | | 119 | 121 | 122 | 124 | 126 | 127 | 128 |
| 67 | | | | | | | | | 124 | 126 | 127 | 128 | 129 | 130 |
| 68 | | | | | | | | | 126 | 128 | 130 | 132 | 133 | 134 |
| 69 | | | | | | | | | 129 | 131 | 133 | 135 | 136 | 137 |
| 70 | | | | | | | | | | 134 | 136 | 138 | 139 | 140 |
| 71 | | | | | | | | | | 138 | 140 | 142 | 143 | 144 |
| 72 | | | | | | | | | | | 145 | 147 | 148 | 149 |

[1] This table is used by the courtesy of Dr. Thomas D. Wood and Professor Bird T. Baldwin.

### Height-Weight-Age Table for Men

| Height | 19 Yr. | 20 Yr. | 21–22 Yr. | 23–24 Yr. | 25–29 Yr. | 30–34 Yr. | 35–39 Yr. | 40–44 Yr. | 45–49 Yr. | 50–54 Yr. | 55–59 Yr. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 ft. | 107 | 110 | 114 | 118 | 122 | 126 | 128 | 131 | 133 | 134 | 135 |
| 5 ft. 1 in. | 112 | 115 | 118 | 121 | 124 | 128 | 130 | 133 | 135 | 136 | 137 |
| 5 ft. 2 in. | 117 | 120 | 122 | 124 | 126 | 130 | 132 | 135 | 137 | 138 | 139 |
| 5 ft. 3 in. | 121 | 124 | 126 | 128 | 129 | 133 | 135 | 138 | 140 | 141 | 142 |
| 5 ft. 4 in. | 124 | 127 | 129 | 131 | 133 | 136 | 138 | 141 | 143 | 144 | 145 |
| 5 ft. 5 in. | 128 | 130 | 132 | 134 | 137 | 140 | 142 | 145 | 147 | 148 | 149 |
| 5 ft. 6 in. | 132 | 133 | 136 | 138 | 141 | 144 | 146 | 149 | 151 | 152 | 153 |
| 5 ft. 7 in. | 136 | 137 | 140 | 142 | 145 | 148 | 150 | 153 | 155 | 156 | 158 |
| 5 ft. 8 in. | 140 | 141 | 143 | 146 | 149 | 152 | 155 | 158 | 160 | 161 | 163 |
| 5 ft. 9 in. | 144 | 145 | 147 | 150 | 153 | 156 | 160 | 163 | 165 | 166 | 168 |
| 5 ft. 10 in. | 148 | 149 | 151 | 154 | 157 | 161 | 165 | 168 | 170 | 171 | 173 |
| 5 ft. 11 in. | 153 | 154 | 156 | 159 | 162 | 166 | 170 | 174 | 176 | 177 | 178 |
| 6 ft. | 158 | 160 | 162 | 165 | 167 | 172 | 176 | 180 | 182 | 183 | 183 |
| 6 ft. 1 in. | 163 | 165 | 167 | 170 | 173 | 178 | 182 | 186 | 188 | 190 | 191 |
| 6 ft. 2 in. | 168 | 170 | 173 | 176 | 179 | 184 | 189 | 193 | 195 | 197 | 198 |
| 6 ft. 3 in. | 173 | 175 | 178 | 181 | 184 | 190 | 195 | 200 | 202 | 204 | 205 |
| 6 ft. 4 in. | 178 | 180 | 183 | 186 | 190 | 196 | 201 | 206 | 209 | 211 | 212 |
| 6 ft. 5 in. | 183 | 185 | 188 | 191 | 194 | 201 | 207 | 212 | 215 | 217 | 219 |

### Height-Weight-Age Table for Women

| Height | 19 Yr. | 20 Yr. | 21–22 Yr. | 23–24 Yr. | 25–29 Yr. | 30–34 Yr. | 35–39 Yr. | 40–44 Yr. | 45–49 Yr. | 50–45 Yr. |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 ft. 10 in. | 98 | 102 | 106 | 110 | 113 | 116 | 119 | 123 | 126 | 129 |
| 4 ft. 11 in. | 103 | 107 | 109 | 112 | 115 | 118 | 121 | 125 | 128 | 131 |
| 5 ft. | 109 | 112 | 113 | 115 | 117 | 120 | 123 | 127 | 130 | 133 |
| 5 ft. 1 in. | 113 | 115 | 116 | 118 | 119 | 122 | 125 | 129 | 132 | 135 |
| 5 ft. 2 in. | 116 | 118 | 119 | 120 | 121 | 124 | 127 | 132 | 135 | 138 |
| 5 ft. 3 in. | 120 | 121 | 122 | 123 | 124 | 127 | 130 | 135 | 138 | 141 |
| 5 ft. 4 in. | 123 | 124 | 125 | 126 | 128 | 131 | 134 | 138 | 141 | 144 |
| 5 ft. 5 in. | 126 | 127 | 128 | 129 | 131 | 134 | 138 | 142 | 145 | 148 |
| 5 ft. 6 in. | 129 | 130 | 131 | 133 | 135 | 138 | 142 | 146 | 149 | 152 |
| 5 ft. 7 in. | 131 | 133 | 135 | 137 | 139 | 142 | 146 | 150 | 153 | 156 |
| 5 ft. 8 in. | 135 | 137 | 139 | 141 | 143 | 146 | 150 | 154 | 157 | 161 |
| 5 ft. 9 in. | 138 | 140 | 142 | 145 | 147 | 150 | 154 | 158 | 161 | 165 |
| 5 ft. 10 in. | 141 | 143 | 145 | 148 | 151 | 154 | 157 | 161 | 164 | 169 |
| 5 ft. 11 in. | 145 | 147 | 149 | 151 | 154 | 157 | 160 | 164 | 168 | 173 |
| 6 ft. | 150 | 152 | 154 | 156 | 158 | 161 | 163 | 167 | 171 | 176 |

**96. Carbohydrates.** This food constituent includes the starches and the sugars. Candy contains a great deal of sugar. Carbohydrates come almost entirely from plants. They furnish the body with an immediately available source of energy. Soldiers are given sweets to enable them to stand the strain of long marches. Swiss guides use milk chocolate. Athletes and horses are given sugar before races. The chief sources of sugar are fruits, vegetables, sugar cane, honey, the sugar maple, and the sugar beet.

The average adult requires about five hundred grams ($500 \times 4.1 = 2050$ calories) of carbohydrate daily to supply the energy needs of his body. If he eats more than this the excess is stored first in the liver and muscles, then as fat between the tissues. The continuous overeating of carbohydrates may overtax the ability of the pancreas to utilize them and lead to diabetes. When the amount of carbohydrate eaten is less than the energy requirements of the body, it is necessary to draw on the stored fat, with the result that the weight falls.

**97. Fats.** The fats in the food are derived principally from butter, cream, milk, olive oil, and the fatty matter found on the various kinds of meat. Fat is usually stored in the body as such, to be gradually broken down for energy purposes as needed. It therefore serves the purpose of a reserve source of energy and fuel.

The average adult requires about one hundred grams ($100 \times 9.3 = 930$ calories) of fat daily. If he eats in excess of this amount, he becomes obese; if he eats less than his proper portion, he loses weight.

**98. Proteins.** The proteins are the body builders, and they alone can replace broken-down tissue. They may also be utilized as sources of energy. Lean meat, after water has been removed, contains 90 per cent of protein. Eggs, fish, cheese, nuts, peas, beans, lentils, wheat gluten, and milk also contain considerable amounts of protein.

The average adult requires about one hundred grams ($100 \times 4.1 = 410$ calories) of protein daily. It was formerly believed that a very much lower quota of protein was sufficient; but recent experience has shown that when one is fed on a low protein diet over a long period of time, the condition known as "war œdema" is apt to result. In Berlin during the World War the poorer classes were reduced to a diet of fifty grams of protein a day, half the ideal allowance, and their fats were largely replaced by carbohydrates. The result was that the condition of war œdema, characterized by weakness, dropsy round the feet and ankles, and low blood pressure, was very common. Our knowledge that growth, nutrition, and resistance to disease are influenced by certain foods in sufficient quantities has been confirmed by the physical and nutritional state of the children in Vienna at the end of the war. Many children of seven years of age were but half the normal weight for that age, and the same condition applied to those younger and older. The bones, in addition to being undersized and malnourished, were distorted and the organs were susceptible to tuberculosis.

**99. Tables of common foods with their caloric value.** The following food tables give portions which contain approximately 100 calories. Refer to the table on page 116 for the approximate number of calories needed by the individual.

SALADS

| KIND | 100 CALORIES |
|---|---|
| Crab meat | $\frac{1}{3}$ serving (2 oz.) |
| Egg | $\frac{2}{5}$ serving (1.4 oz.) |
| Potato | $\frac{1}{2}$ serving (1.7 oz.) |
| Sardine | $\frac{1}{3}$ serving (1.1 oz.) |
| Tomato and cucumber | $\frac{5}{8}$ serving (2 oz.) |
| Tomato and lettuce | $\frac{1}{2}$ serving (2.7 oz.) |
| Waldorf | $\frac{2}{5}$ serving (1.2 oz.) |

### Fruits

| Kind | 100 Calories |
|---|---|
| Apple | 1 large apple |
| Apple (baked) | ½ large apple, with 2 tablespoons juice |
| Apple sauce | ⅜ cup |
| Apricots (stewed) | ¼ cup |
| Banana | 1 large banana |
| Berries | 1 cup |
| Cantaloupe | 1 melon 4½ inches in diameter |
| Cherries | 1 cup |
| Dates | 4 dates |
| Figs | 1½ figs |
| Grapefruit | 1 grapefruit |
| Grapes | 20 grapes |
| Orange | 1 large orange |
| tangerine | 2 tangerines |
| Peach | 3 medium peaches |
| Pear | 2 medium pears |
| Pineapple (fresh) | 2 slices one inch thick |
| Plums | 4 medium plums |
| Prunes (stewed) | 2 prunes with 3 tablespoons juice |
| Rhubarb (stewed) | ½ cup |

### Breadstuffs and Cookies

| Kind | 100 Calories |
|---|---|
| Bread | |
| graham | Medium loaf, slice ½ inch thick |
| toasted | Medium loaf, slice ½ inch thick |
| white | Medium loaf, slice ½ inch thick |
| whole-wheat | Medium loaf, slice ½ inch thick |
| Bun (sugar) | ½ small bun |
| Coffee cake | 1½ inch cube |
| Cookies | 1 cooky 3 inches in diameter |
| Corn bread | Slice 2 in. by 2 in. by 1 in. |
| Doughnut | ½ medium doughnut |
| Griddlecake | 1 cake 4 inches in diameter |
| Muffin | ¾ muffin |
| bran | 1 small muffin |
| Roll | 1 roll |
| Waffle | ½ waffle 6 inches in diameter |
| Zwieback | 3 pieces |

### MEAT, FISH, AND SEA FOOD

| KIND | 100 CALORIES |
|---|---|
| Bacon | 4 small slices |
| Beef (dried) | 4 slices 4 in. by 5 in. |
| Beef stew | 2/5 cup |
| Bologna | 1 slice 4 inches in diameter and 1/4 inch thick |
| Chicken | 1/4 cup |
| chow mein | 1/4 cup |
| fricassee | 1/4 cup |
| a la King | 1/4 cup |
| Clams | 6 to 12 clams |
| Codfish (creamed) | 1/2 cup |
| Corned beef | 1 slice 4 in. by 1 in. by 1 in. |
| Duck | Very small portion |
| Frankfurter | 1 small frankfurter |
| Halibut | 3 in. by 2 1/4 in. by 1 in. |
| Ham | 1 slice 4 inches in diameter, 1/8 inch thick |
| Ham omelet | 1/3 cup |
| Hamburger steak | 2 1/2 inches in diameter and 7/8 inch thick |
| Lamb chop | 1 chop 2 in. by 2 in. by 1/2 in. |
| Liver | 2.1 ounces |
| Lobster | 3/4 cup |
| Mackerel | Medium portion |
| Oysters | 6 to 12 oysters |
| Pork chop | 1/2 average chop |
| Roasts | |
| beef | 1 slice 5 in. by 2 1/2 in. by 1/4 in. |
| lamb | 1 slice 5 in. by 2 1/2 in. by 1/4 in. |
| pork | 1 slice 2 in. by 2 1/4 in. by 1/8 in. |
| veal | 1 slice 2 in. by 2 3/4 in. by 1/8 in. |
| Salmon | |
| canned | 1/2 cup |
| fresh | Average portion |
| Sardines | 3 to 6 sardines |
| Sausage | 2 small sausages |
| Scallops | 1/2 cup |
| Smelts | 3 average smelts |
| Steak (sirloin) | 2 in. by 1 1/2 in. by 3/4 in. |
| Tongue | 2 small slices |
| Trout | 3 8-inch trout |
| Tuna fish | 1/2 cup |
| Turkey | Small portion |
| Veal cutlet | 2/5 serving |

## VEGETABLES

| KIND | 100 CALORIES |
|---|---|
| Asparagus | 20 stalks |
| Beans, string | 2 cups |
| Cabbage | 2 cups |
| Carrots | 4–5 young |
| Cauliflower | small head |
| Celery | 30 stalks |
| Cole slaw | 1 cup |
| Lettuce | 2 heads |
| Onions, creamed | 2 onions |
| Parsnips | 3 large slices |
| Peas, fresh or canned | ¾ cup |
| Potatoes, baked or boiled | 1 medium |
| Spinach | 2 cups |
| Tomatoes, canned or raw | 2 cups; 2–3 medium |
| Turnips | 1 cup |

## MISCELLANEOUS

| KIND | 100 CALORIES |
|---|---|
| Apple sauce | ⅜ cup |
| Baked beans | ⅓ cup |
| Candy | |
| chocolate cream | 1 piece |
| fudge | 1 inch cube |
| Cheese soufflé | 1½ cup |
| Crackers | |
| graham | 2 crackers |
| saltine | 6 crackers |
| Cranberry sauce | ¼ cup |
| Honey | 1 tablespoon |
| Ice cream | ⅓ average soda portion |
| Jam | 1 tablespoon |
| Jelly | 1 tablespoon |
| Macaroni (plain) | 1 cup |
| Macaroni and cheese | ½ cup |
| Maple sirup | 1 tablespoon |
| Peanut butter | 1 tablespoon |
| Popovers | 1 popover |
| Rice, cheese, and tomatoes | ¼ cup |
| Sugar | 3 teaspoons |

## Desserts

| Kind | 100 Calories |
|---|---|
| Apple dumpling | 1/3 medium dumpling |
| Apple snow | 1 cup |
| Apple tapioca | 1/4 cup |
| Bread pudding | 1/4 cup |
| Brown Betty | 1/3 cup |
| Cake | |
| angel | 2 in. by 2 in. by 2 in. |
| fruit | 1 inch cube |
| layer | 2½ in. by 2½ in. by 1 in. |
| plain | 1¾ inch cube |
| Charlotte russe | 1/2 charlotte russe |
| Chocolate blancmange | 1/4 cup |
| Coffee jelly | 1 cup |
| Cornstarch pudding | 1/4 cup |
| Cream puff | 3/4 cream puff |
| Custard | |
| cup | 1/3 cup |
| soft | 1/3 cup (scant) |
| Fig pudding | 1/8 cup |
| Floating island | 1/3 cup |
| Gingerbread | 1 in. by 2 in. by 2 in. |
| Ice cream | 1/4 cup |
| Jello | 1/2 cup |
| Junket | 1/2 cup |
| Macaroons | 2 macaroons |
| Pie | |
| apple | 1½ inches at circumference |
| custard | 2 inches at circumference |
| lemon | 1 inch at circumference |
| mince | 1 inch at circumference |
| pumpkin | 2 inches at circumference |
| squash | 2 inches at circumference |
| Plum pudding | 1 inch cube |
| Prune souffle | 2/3 cup |
| Rice pudding | 1/2 cup |
| Sherbet | 1/4 cup |
| Strawberry shortcake | 1/3 average portion |
| Tapioca | 2/3 cup |

### Beverages

| Kind | 100 Calories |
| --- | --- |
| Cocoa | $\frac{1}{2}$ cup |
| Coffee | 1 cup with 2 teaspoons sugar and 1 teaspoon cream |
| Fruit juice | $\frac{1}{2}$ cup |
| Milk | $\frac{5}{8}$ cup |
| Postum | 1 cup with 2 teaspoons sugar and 1 teaspoon cream |
| Tea | 1 cup with 2 teaspoons sugar and 1 teaspoon cream |

### Dairy Products and Fats

| Kind | 100 Calories |
| --- | --- |
| Bacon fat | 1 tablespoon |
| Butter | 1 tablespoon |
| Cheese | |
| cottage | $5\frac{1}{2}$ tablespoons |
| full cream | 2 in. by 1 in. by $\frac{3}{8}$ in. |
| Neufchatel | 2 tablespoons |
| Swiss | $4\frac{1}{2}$ in. by $3\frac{1}{2}$ in. by $\frac{1}{8}$ in. |
| Cream | |
| 18 per cent fat | $\frac{1}{4}$ cup |
| 40 per cent fat | $1\frac{1}{3}$ tablespoons |
| Oleomargarine | 1 tablespoon |
| Olive oil | 1 tablespoon |

### Nuts

| Kind | 100 Calories |
| --- | --- |
| Almonds | 12 to 15 nuts |
| Brazil nuts | 2 nuts |
| Butternuts | 4 to 5 nuts |
| Hickory nuts | 15 nuts |
| Peanuts | 20 to 24 nuts |
| Pecans | 12 nuts |
| Walnuts | 8 to 16 nuts |

CEREALS

| KIND | 100 CALORIES |
| --- | --- |
| Cooked, such as corn meal, oatmeal, or rice | $\frac{1}{3}$ cup cereal with $\frac{1}{4}$ cup milk and 1 teaspoon sugar |
| Uncooked, such as corn flakes | $\frac{1}{2}$ cup cereal with $\frac{1}{4}$ cup milk and 1 teaspoon sugar |

EGGS

| KIND | 100 CALORIES |
| --- | --- |
| Boiled or poached | 1 large egg |
| Fried | 1 small egg |
| Omelet | 1 egg |
| Scrambled | $\frac{1}{2}$ cup |

**100. Choosing a diet to help keep your weight up to standard.** It has been known for a long time that babies needed to have proper weight for their height and age in order to be healthy. Now it is known that the same thing is true of older children and adults. Before the age of thirty it is desirable to keep the weight within a range of 5 per cent below and 5 per cent above the standard weight.

Before the age of thirty, underweight is usually associated with fatigue, lack of energy, pallor, and susceptibility to infection. The body does not usually have that reserve of vitality and resistance to disease which is characteristic of robust health. The right kind of living, which restores normal weight, brings about a marked improvement both physically and mentally.

Underweight means either that not enough food of a certain kind has been consumed, so that an excess could be accumulated in the tissues, or that energy has been expended too freely. To take on weight may involve taking more rest and sleep or, possibly, observing more carefully some other health

rules. Usually it has something to do with the diet. Foods that are best for increasing weight are these:

| | | | |
|---|---|---|---|
| Butter | Potatoes (sweet) | Bread | Macaroni |
| Cream | Milk | Crackers | Biscuits |
| Oil | Cheese | Cereals | Muffins, and flour mixtures of all kinds |
| Salad dressing | Peanuts | Rice | |

Rich milk, vegetables, cereals, and fruits should be supplied in abundance, and then as much fat as the digestion will stand. One cause of underweight is due to not eating enough food. The amount of food can be increased sometimes by a luncheon, in the midmorning, midafternoon, or evening, of crackers and milk, crackers and cheese, or other similar food.

Underweight may be influenced by heredity or by a period of rapid growth at adolescence. It is never safe to conclude that because one is underweight he is malnourished. Weight according to height and age is only one of many indices of health. In case of serious underweight a physician should be consulted.

Overweight indicates that more food of a certain kind has been consumed than the body needs to maintain its activity. The excess has accumulated as fatty tissue. Overweight throws a strain upon the heart and vital organs and interferes with physical and mental efficiency. Diabetes, gout, high blood pressure, hardening of the arteries, and stomach disturbances are frequently associated with overweight. After one has passed the age of thirty it is especially undesirable. Insurance companies regard people past middle life as better risks if they are a little under average weight.

To reduce one's weight it is necessary to limit those foods that have been referred to as helping to increase the weight. In large measure success will depend on limiting the supply of fats, starchy foods, and sugars and sweets of all kinds. The number of calories should be so low that the body will burn up its own supply of fat to furnish energy. For this reason

vegetables and fruit should be supplied generously. These bulky foods give a physical and mental sense of satisfaction in a good meal but have a low caloric value.

**101. Why patent medicines for reducing weight should be avoided.** Many drugs in the form of patent medicines are advertised as being effective in the reduction of weight. Most of them are harmful and poisonous. None should be taken unless prescribed by a physician after a thorough and careful examination of the individual. Glandular extracts, particularly those from the thyroid gland, have been extensively advocated; but their use should likewise be discouraged, except under the constant guidance of a physician. It is not uncommon for people to take thyroid-gland extract without a physician's order, and seriously damage their heart and other organs.

**102. Food accessories.** Besides such materials as proteins, fats, and carbohydrates, which supply material for energy, growth, and repair, there are other substances which influence the course of events within the body. They are called food accessories. Among them are water, inorganic salts, vitamins, and roughage.

*Water.* Water constitutes more than two thirds of the body weight and is present in practically all foods. It does not build body tissue or yield energy, but is nevertheless an indispensable element of all tissues. It is the important carrier and solvent for the many chemical elements by which we live and grow. Among the more important of these chemical elements may be mentioned iron, iodine, calcium, phosphorus, sodium, potassium, oxygen, hydrogen, nitrogen, and carbon. These elements existing in combined states form the cells, tissues, organs, fluids, and secretions which are concerned with the business of life itself. One of the best health habits is to drink plenty of water every day.

*The importance of inorganic salts (mineral salts).* While not sources of energy, inorganic salts are just as necessary

constituents of the diet as are fats, carbohydrates, and proteins. In fact, they are indispensable to growth and normal nutrition; none of the normal physiological processes of the body, such as secretion and excretion, can go on without them. These salts must be constantly supplied by food. We must have iron for the hæmoglobin in the red blood corpuscles, phosphorus for the brain and nerve cells, calcium for the bones and teeth, and iodine for the thyroid gland. Sodium and potassium aid in maintaining the alkaline reaction of the blood. The various organs and cells contain these mineral salts, but food must resupply the normal content. A large part of the valuable mineral salts is extracted during the *steaming* of vegetables. The vegetable water makes an excellent stock for cream soups and sauces.

The importance of common salt in the diet has long been recognized. Cattle will often travel for miles in quest of the salt licks. Feeding an animal on a salt-free diet results in a steady decline and eventually in death. The following table indicates the chief sources of various minerals found in foods:

***Foods rich in iron***

Egg yolk, wheat, liver, beef juice, and molasses.

***Foods rich in calcium***

Milk and dairy products, green and leafy vegetables, carrots, and turnips.

***Foods rich in phosphorus***

Vegetables, fruit, cheese, eggs, whole-wheat flour (graham), rye, oatmeal, molasses, and maple sirup.

***Foods rich in iodine***

Sea food (fish and shellfish), watercress, and sea salt (natural).

Our most recent information about iodine indicates that it plays a very important part in the general metabolism. In those regions where there is a marked deficiency of iodine in the

water and food, a serious enlargement of the thyroid gland, known as goiter, is prevalent. Throughout the United States there are goiter belts. Investigation shows that such regions have a deficiency of iodine in the drinking water. Some cities have adopted the plan of introducing iodine into the water supply.

In addition to the mineral salts mentioned, there are many others of importance to health.

*Vitamins.* Vitamins are substances of unknown composition which are present in small quantities in various foods and which are essential to normal nutrition and growth. The absence of vitamins from the diet may produce diseases known as the vitamin-deficiency diseases. The value of vitamins was discovered by experiments in which animals were kept on diets containing nothing but protein, fat, and carbohydrates. Each of these food constituents was thoroughly purified before being given, so that there was no possibility of any other food factor's being present. It was then found that the three factors (fats, carbohydrates, and proteins) alone were not capable of promoting growth or sustaining life.

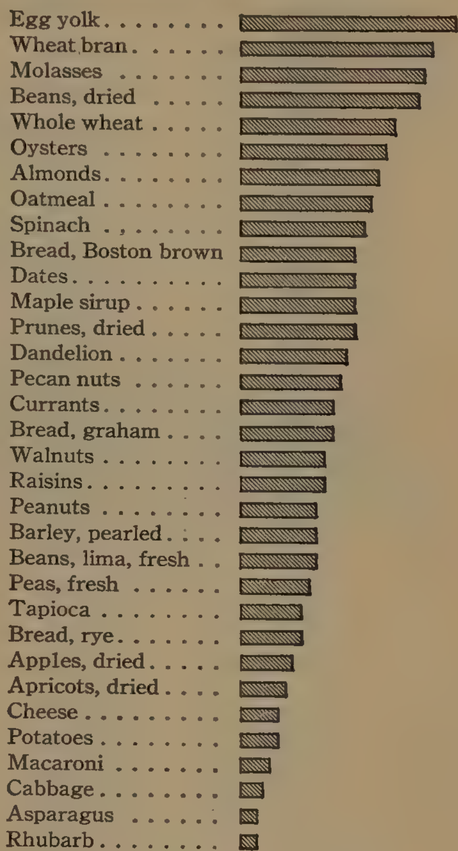



FIG. 47. Iron content of various foods

The glandular organs used as foodstuffs (liver, pancreas, and kidney) are especially rich in iron

Five vitamins are now known, as follows:

1. *Fat-soluble vitamin A* is concerned mainly with growth. Without it, growth is apt to be stunted.

Absence of this vitamin from the diet causes an inflammation of the eye known as xerophthalmia. Vitamin A is largely

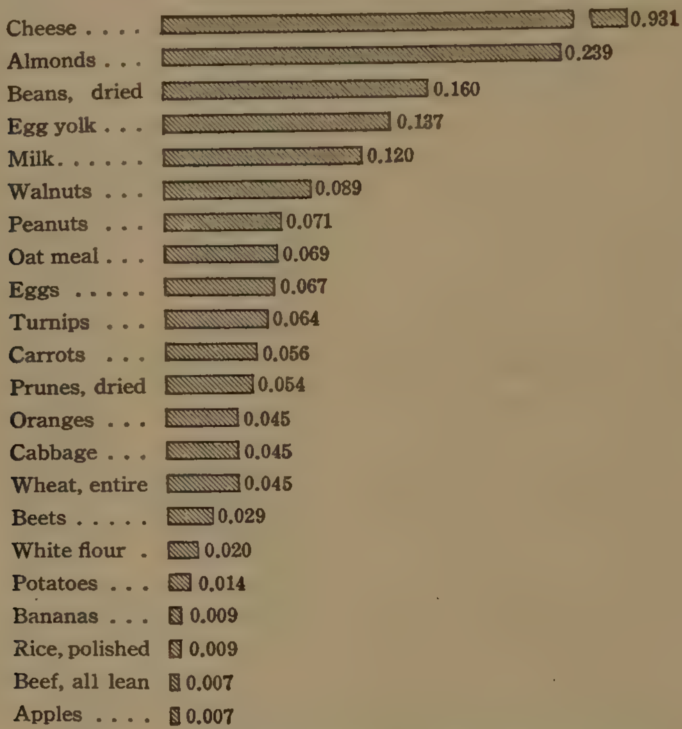



FIG. 48. Approximate amounts of calcium per 100 grams in various foods[1]

present in butter, fat, cream, and egg yolk. It is found also, though in smaller quantities, in leafy vegetables. Recent studies indicate that there is a relation between the greenness of leaves and their vitamin content. Thus it was found that the outside green leaves of lettuce were richer in vitamin A than the inside yellow leaves. Leaf lettuce excelled head lettuce in

[1] From Chemistry of Food and Nutrition by Henry C. Sherman. By permission of The Macmillan Company, publishers.

the same respect. It is most abundant of all in good cod-liver oil. During the recent World War thousands of children and infants in Denmark developed xerophthalmia with resulting blindness owing to the absence of butter in their dietary. It appears that a large part of the Danish community interested in dairy farms exported their dairy products to neighboring countries, leaving themselves without butter, milk, and cheese.

2. *Water-soluble vitamin B* is found in the bran layers of cereals and in vegetables, milk, eggs, liver, and pancreas,

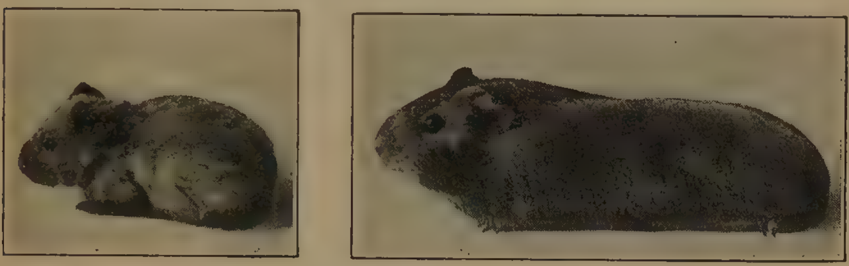


FIG. 49. Food made the difference

These guinea pigs were from the same litter. The smaller pig had a diet deficient in vitamins. (Courtesy of Dr. Percy R. Howe, Forsyth Dental Infirmary)

but is relatively absent from ordinary meat. It is more widely distributed than vitamin A. Yeast is one of the richest known sources of vitamin B. A deficiency of vitamin B in the diet results in a disease known as beriberi, which is characterized by paralysis of the limbs. Foods lose their vitamin-B value when they are subjected to excessive heat, drying, or other method of preservation. Dry foodstuffs are deficient in this factor (dried milk, dried fruits, and dehydrated vegetables). In the case of canned fruits and vegetables the acidity of the liquid increases the stability of the vitamins and to some extent prevents the destruction which would otherwise occur during the sterilization by heat. The absence of vitamin B has been responsible for the wide prevalence of beriberi

in the Far East. The poorer classes of China and Japan live largely on rice. The vitamin-B content of this cereal is found in and near the husk of the grain. It was found that polishing rice improved its appearance and perhaps even its flavor, and therefore the custom of polishing rice before using it for food had become an established custom and procedure in the Orient. The use of polished rice was followed by the disease beriberi, which carried off victims by thousands, until the discovery was made that unpolished rice would prevent and cure it.

3. *Water-soluble vitamin C* guards the body against scurvy. Oranges, lemons, limes, tomatoes, and cabbage are rich in this vitamin. This antiscorbutic vitamin is destroyed by excessive heat. In former days, when sailors were compelled to undertake long voyages without a supply of fresh vegetables, they were particularly subject to scurvy.

Napoleon lost thousands of his soldiers from scurvy during his march to Moscow in 1812. During the Crimean War twenty-five hundred cases appeared among the French troops alone, and in our own Civil War 15 per cent of the deaths were due to this disease. When scurvy broke out in Alaska an orange was worth its weight in gold.

4. *Vitamin D* is accessory to fat-soluble A. It is found in butter, but especially in cod-liver oil. Its specific function is to regulate calcium and phosphorus metabolism. Its use prevents and cures rickets.

5. *Vitamin E* is most abundant in the wheat germ. Its deficiency has been shown to produce sterility in animals.

*Roughage.* Various foods contain certain amounts of cellulose or material indigestible in the body, called roughage, which plays an important part in the regulation of the action of the bowels. When the diet is too rich and is lacking in roughage, the person is apt to become constipated.

**103. Balanced diet.** A balanced diet is one that contains in proper amounts all the essential and accessory food factors.

It is not enough merely to have sufficient protein to replace broken-down tissue and enough carbohydrate, fat, and protein to supply the energy requirements of the body: there must be enough water to preserve the fluidity of the circulating media of the body, the inorganic salts must be present in proper amounts, all five vitamins are needed, and enough roughage is required to maintain the function of the bowels. All these requisites may best be met by a dietary of the widest possible variety.

**104. Balanced meals.** The following outline indicates in a general way a balanced ration for a day:

***Breakfast***

*Fruit* (mineral salts, vitamin) in some form, preferably fresh.
*Cereal* (carbohydrate and vitamin) cooked, whole-wheat, grain.
*Eggs* (protein and fat).
*Bread* (carbohydrate) *and butter* (fat and vitamin) including toast or muffins, etc.
*Milk* (all six food constituents).

***Lunch***

*Soup* (mineral salts and water).
*Salad* (mineral salts, vitamins, carbohydrates).
*Sandwiches* of bread, butter, and cold cuts (carbohydrates, fat, protein, and vitamins).
*Milk* (all six food constituents).
*Stewed or fresh fruit* (mineral salts, vitamins, and carbohydrates).

***Dinner***

*Meat, poultry, or fish* (protein and fat).
*Vegetables* (carbohydrates and vitamins).
*Bread or rolls and butter* (carbohydrates, fat, and vitamins).
*Salad* (vitamins, fat, carbohydrates, and mineral salts). It should include green vegetables with olive-oil dressing.
*Dessert* (in the form of pudding, fresh or stewed fruit) (carbohydrates, fat, water).

Relative Amounts of Vitamins in Foodstuffs[1]

| Foodstuffs | A | B | C |
|---|---|---|---|
| **Meats** | | | |
| Beef heart | + | + | ? |
| Brains | ++ | +++ | + ? |
| Codfish | + | + | ? |
| Fish roe | + | ++ | ? |
| Herring | ++ | ++ | ? |
| Kidney | ++ | ++ | |
| Lean muscle | 0 | 0 | + ? |
| Liver | + | + | + ? |
| Pancreas | 0 | +++ | |
| Thymus (sweetbreads) | 0 | 0 | 0 |
| **Vegetables** | | | |
| Cabbage (fresh) | +++ | +++ | ++++ |
| Carrots | +++ | +++ | ++ |
| Cauliflower | ++ | +++ | ++ |
| Celery | + | +++ | + |
| Chard | +++ | ++ | ? |
| Lettuce | ++ | ++ | ++++ |
| Onions | + | +++ | +++ |
| Parsnips | ++ | +++ | +++ |
| Peas (fresh) | ++ | ++ | +++ |
| Potatoes | 0 | +++ | ++ |
| Spinach | +++ | +++ | +++ |
| Sweet potatoes | +++ | ++ | ? |
| **Cereals** | | | |
| Barley | + | +++ | ? |
| Bread (white) | | + | |
| Bread (whole-meal) | + | +++ | ? |
| Maize (corn) | + yellow<br>0 white | +++ | ? |
| Oats | + | +++ | 0 |
| Rice (polished) | 0 | 0 | 0 |
| Rice (whole-grain) | + | +++ | 0 |
| **Other seeds** | | | |
| Beans (kidney) | 0 | +++ | |
| Beans (navy) | | +++ | 0 |
| Peanuts | + | ++ | |
| Peas (dry) | + ? | ++ | 0 |

[1] W. H. Eddy, The Vitamin Manual, pp. 59–61. Williams and Wilkins Co., Baltimore, 1921.

RELATIVE AMOUNTS OF VITAMINS IN FOODSTUFFS (CONTINUED)

| FOODSTUFFS | A | B | C |
|---|---|---|---|
| **Fruits** | | | |
| Apples | 0 | ++ | + |
| Bananas | ? | + | ++ |
| Grapefruit | | +++ | +++ |
| Grape juice | | + | + |
| Grapes | | + | + |
| Lemons | | +++ | ++++ |
| Limes | | ++ | ++ |
| Oranges | | +++ | ++++ |
| Pears | | ++ | ++ |
| Raisins | | + | + |
| Tomatoes | ++ | +++ | ++++ |
| **Oils and fats** | | | |
| Beef fat | + | 0 | 0 |
| Butter | ++++ | 0 | 0 |
| Cod-liver oil | ++++ | 0 | 0 |
| Corn oil | 0 | 0 | 0 |
| Egg-yolk fat | ++++ | 0 | 0 |
| Lard | 0 ? | 0 | 0 |
| Oleo (animal) | + | 0 | 0 |
| Oleo (vegetable) | 0 | 0 | 0 |
| Olive oil | 0 | 0 | 0 |
| **Nuts** | | | |
| Almonds | + | +++ | |
| Brazil nuts | | +++ | |
| Coconuts | ++ | +++ | |
| English walnuts | | +++ | |
| Filberts | | +++ | |
| **Dairy Products** | | | |
| Butter | ++++ | 0 | 0 |
| Cheese | ++ | + | ? |
| Cream | +++ | + | ? |
| Eggs | ++++ | ++ | 0 |
| Milk (condensed) | ++ | + | 0 |
| Milk (whole) | +++ | +++ | ++ |
| Milk, powder (skimmed) | + | +++ | + ? |
| Milk, powder (whole) | +++ | +++ | + ? |
| **Miscellaneous** | | | |
| Honey | | ++ | 0 |
| Yeast (brewers') | 0 | ++++ | 0 |
| Yeast cakes | 0 | ++ | 0 |

**105. Three things necessary for the most satisfactory diet.** It is frequently assumed that to eat the right kind of food means practicing a good deal of self-denial. Only to a slight extent is this true. It is possible by knowing the essentials of a good diet to select an appetizing as well as a nourishing meal. Food that is not harmful but is simply deficient in certain elements of nutrition may be consumed, provided that it is supplemented by just those things that it lacks. For example, white bread is not as nutritious as bread made from whole-wheat flour; yet when combined with butter, milk, and vegetables white bread is quite satisfactory.

Dr. McCollum tells us that the most satisfactory type of diet must include three essentials:

1. *Dairy products.* All those people who have used dairy products have been generally superior physically to other peoples. The diet of the pastoral Arabs consists largely of milk derived from sheep, goats, and camels. The Arab has splendid physical development. In the time of Napoleon this was recognized. One of his generals who had made an expedition into Syria said, "Their physical structure is in all respects more perfect than that of Europeans; their sense organs are exquisitely acute, their size above the average of men in general, their figure robust and elegant, their color brown."

Although milk is deficient in iron, which may be supplied through vegetables, it is the most perfect food known. Many children who have suffered from malnutrition have been restored to health by drinking plenty of milk. The value of milk in the diet has been so generally recognized in recent years that the amount per capita consumed is steadily increasing. The half pint per capita now being used should be increased to at least one pint. Not only is milk desirable for children but also for adults. Among the dairy products which should be generously patronized are butter, cheese, and ice cream.

2. *Leafy vegetables.* One of the greatest discoveries in the history of nutrition research was the value of the dietary properties of the leaf as compared with the other parts of a plant. Scientists became convinced, about 1916, that cereals, tubers, roots, and legume seeds used collectively in any proportions did not make a satisfactory diet. Since some of the Oriental peoples subsisted fairly well on a vegetable diet, it was a problem as to what supplied the deficiency. Since meats were deficient in many of the elements also lacking in most vegetables, they could not supply the deficiency. It was noticed that animals fed entirely on seeds and tubers did not do as well as on a mixed diet of seeds, tubers, and leaves. Some of the wild animals (for example, the bison) never ate anything but grass. Experiment showed the very great importance in the diet of leafy vegetables, such as cabbage, spinach, and lettuce.

3. *Raw vegetables.* Since the cooking of food destroys vitamin C, the lack of which results in scurvy and other allied troubles, there should daily be some kind of raw vegetable food in the diet. Apples, oranges, lettuce, radishes, and raw onions are desirable. Salads are especially desirable. It is a good habit to eat one or two salads every day.

**106. Food poisoning.** Poisoning may result from the eating of food that has been infected with germs, from botulism, or from eating spoiled food. The discussion of infected food is found in Chapter XX.

Botulism is a type of food poisoning due to the toxin of *Clostridium botulinum.* The organism was first isolated in the outbreak of sausage poisoning in 1894. Most of the cases reported in the United States have been due to canned vegetables and fruits. The most recent cases, reported in 1919 and 1920, were due to ripe olives from California.

Representatives of the Bureau of Chemistry of the United States Public Health Service have made careful investigation

of the olive-packing plants in California, and it has been found that the degree of sterilization in the case of olives packed in glass is usually inadequate. The jars are usually heated for approximately half an hour at a temperature of boiling water, which is not sufficient to insure the destruction of the *Clostridium botulinum* if this organism is present in ripe olives.

No one knows just how the germ gets into any particular food. It has been found in articles put up in the home by the careful housewife and in goods packed in commercial houses. It may be present in a few packages only. There is no method by which packers or home canners can assure themselves by careful examinations before canning that a product does not contain the organism. If the foods were in all cases properly sterilized and perfectly sealed, the development of a poison would be impossible, but no method of preserving food has yet been found which eliminates the occasional spoiled package. Failure to sterilize may not become apparent for weeks or even months after canning. If the signs of spoilage have appeared when the container is opened, it is a clear warning that the product is no longer edible. No food of any description showing even the slightest unnatural odor, unnatural color, swelling of the container, signs of gas, or any evidence of decomposition whatever should be used for food purposes. In practically every case of botulism the food was shown to have had an offensive or abnormal odor.

The earliest symptom of botulism is a peculiar indefinite indisposition associated with a feeling of fatigue, sometimes with headache or dizziness, and with definite muscular weakness. Disturbances of vision occur, in many cases being the first definite sign of serious illness noted by the patient. This is due to a condition of the muscles of the eye caused by an involvement of one of the cranial nerves.

An antitoxin has been prepared for the treatment of botu-

lism, and there is a belief that it may be of value in treatment if the disease can be diagnosed in the early stages and treatment started promptly.

**107. Pure-food laws.** The Federal and state governments have passed laws to protect the consumer against adulterated and impure food. Milk may have the cream removed; water and coloring matter may be added. Alum is sometimes added to flour. Candies and pastry may be adulterated by


FIG. 50. A health hero receives recognition

This medal was presented to Dr. Harvey W. Wiley on his eightieth birthday by the Association of Official Agricultural Chemists in memory of his courageous battle for pure foods

the addition of coloring matter. Shellac may be used for coating candies, and sweetened grease be used for chocolate fillings. Harmful coal-tar dyes may be added to sodas, orangeade, and other soft drinks. Chemicals such as benzoate of soda are used to preserve sausage.

For the enforcement of laws dealing with pure foods there are many inspectors employed by Federal, state, and city governments. These examine the milk supply, inspect meats, see that foods are sold under proper labels, inspect eating houses, and issue certificates. In case of violation of the law they take an active part in the prosecution of offenders.

**108. The cooking of food.** Cooking is one of the greatest sanitary innovations ever introduced by man to protect him against infection and to promote his health.

The heat required for thorough cooking kills all forms of infection and renders food entirely safe so far as that feature is concerned. Cooking destroys the trichina, the tapeworm and other intestinal parasites, and the tubercle bacilli in tuberculous beef. If fish and shell food be subjected to sufficient heat in the act of cooking, colon and typhoid bacilli will be destroyed.

Cooking has the advantage of making food tender by softening the connective tissue of the meat, thereby making it more readily digestible. Cooking also adds to the tastefulness and the flavor of food. This is very important, since food that is savory and appetizing stimulates the secretion and flow of the digestive juices and so aids digestion.

The principal methods of cooking are roasting, broiling, boiling, frying, and stewing. In roasting or broiling, the juices are retained because the heat coagulates the exterior of the food. In boiling meat for soup it should be plunged into cold water and gradually heated; but meat should be placed in boiling water if the object is to keep the flavors within. Stewing meat is very desirable, because all the juices are retained, and it also permits the addition of vegetables. Frying consists in placing the food in very hot fat, lard, or vegetable oil. This brings about a coagulation of the surface, so that juices and flavors may be retained. If the fat is not very hot it will penetrate the meat or other food and make it greasy and unpalatable. Fried foods are likely to be indigestible because of the large amounts of fat that adhere to them and penetrate into them. It is dangerous to use copper utensils for cooking.

**109. Spoiled food.** The eating of food that has been allowed to undergo decomposition may cause vomiting and diarrhea.

This is the condition that is commonly but erroneously called ptomaine poisoning. A refrigerator for keeping food is almost indispensable, especially in the summer.

**110. Canned foods and dried foods.** In spite of a certain prejudice on the part of some people against canned foods they are really safe. They need to be supplemented, however, by some fresh foods. Dried foods retain their nutritive value; but since there is a diminution in their vitamin content, they also need to be supplemented by fresh fruits and vegetables. There has been much discussion concerning the effect of benzoate of soda as a preservative. The prevailing opinion seems to be that small quantities of benzoate, such as one tenth of 1 per cent, would not be harmful in foods like catchup, of which we take only small quantities; in soups and similar foods taken in quantity it may be harmful.

**111. Alcohol, coffee, tea, and cocoa.** Alcohol is to be regarded as a drug and should not be taken except on the advice of a physician. At the present time less than 5 per cent of the liquor illicitly obtained is free from other poisons in addition to alcohol. These poisons include wood alcohol, denatured alcohol, and fusel oil (for further discussion of alcohol see Chapter XIX).

Although coffee and tea appear different to sight and taste, physiologically their effects are due to the same two substances: caffeine (or theine) and tannic acid (or tannin). Caffeine is a powerful stimulant, especially of the heart and nervous system; tannin is a bitter substance which may hinder digestion and injure the mucous membrane of the stomach. Since coffee is made stronger than tea, it is usually the stronger stimulant. Neither tea nor coffee should be boiled, nor should tea be steeped for a long time, as these processes bring out the tannin. Coffee should merely be brought to a boil. Tea leaves should have boiling-hot water poured over them and be allowed to stand.

Tea and coffee if used in moderation by adults are probably harmless. They should be used sparingly by nervous people and those whose digestion is feeble and slow. Children and young people are better off without this stimulation. It is unwise to drink strong coffee in order to keep awake for evening study. In such cases rest and sleep are desirable.

Cocoa has a high nutritive value; it is also mildly stimulating because it contains theobromine, a substance similar to caffeine.

**112. Food fads.** Food fads have no scientific basis. Among such fads are vegetarianism and Fletcherism. The latter fad maintained that the various ills of the body could be cured by a thorough mastication of food. Good health is not to be found by any one road, but through a careful consideration of everything that affects health.

**113. Milk as the one best food.** Clean milk is an ideal food because it contains fat, carbohydrate, and protein, which create heat, energy, and growth; salts containing calcium and phosphorus, which build the bony structure of the body, including the teeth; water and vitamins, which are essential for growth and the maintenance of health. Milk is the principal food for infants under six months. Because of its insufficient iron content, a soft diet should be added to milk for infants when they are six months old. After they are one year of age less stress should be placed on the use of milk for infants and more should be placed on cereals, vegetables, and fruits. Young children and those of pre-school age should have one pint of milk a day, in addition to milk utilized in the preparation of foods such as creamed soups, cereals, puddings, sauces, ice cream, and the like.

Not all people like milk; others cannot drink it because of the digestive disturbances it produces. To overcome these objections, people should be taught how to *eat* milk. This can be accomplished in many ways, as the following table shows:

| Soups | Creamed Vegetables and Meat Dishes | Milk Drinks |
|---|---|---|
| Cream of potato | Creamed potatoes | Milk shakes |
| Cream of mushroom | Creamed carrots and peas | chocolate |
| Cream of celery | Creamed cabbage | vanilla |
| Cream of lima beans | Creamed celery | orange |
| Cream of pea | Creamed brussels sprouts | Eggnog |
| Cream of spinach | Creamed cauliflower | chocolate |
| Cream of corn and tomato | Creamed turnips | fruit |
| Cauliflower | Scalloped cabbage | nutmeg |
| Oyster stew | Scalloped onions | cinnamon |
| Tomato bisque | Scalloped celery | Malted milk |
| | Scalloped cauliflower | plain |
| | Scalloped potatoes | chocolate |
| | Scalloped meats | |

| Desserts | Desserts | Desserts |
|---|---|---|
| Junket | Soft custards | Baked custards |
| vanilla | vanilla | coconut |
| caramel | chocolate with marshmallow | vanilla |
| chocolate | caramel | caramel |
| Bread pudding | coconut-orange with meringue | date |
| raisin | pineapple | Spanish cream |
| caramel-nut | lemon | with nuts |
| banana | Rice pudding | with fruit |
| chocolate-nut | with milk or cream | maple |
| maple | with chocolate sauce | banana |
| queen | with dates | chocolate |
| Floating island | with raisins | caramel |
| with sponge cake | chocolate with meringue | coconut |
| with bananas | lemon | Cornstarch pudding |
| with oranges | caramel | with fruit |
| with peaches | Bread-and-butter pudding | with fruit sauce |
| chocolate | plain | with chocolate sauce |
| coconut | with marmalade | with caramel sauce |
| Tapioca cream | | vanilla |
| plain | | chocolate |
| date | | caramel |
| chocolate | | |

**114. Idiosyncrasy to food substances.** Peculiar susceptibilities to articles of diet are not uncommon. It has been known for a long time that certain foods do not agree with some people. This disturbance manifests itself in the form of asthma, hives, eczema, and other disturbances. These peculiar disturbances are due to anaphylaxis, or specific hyper-susceptibility to certain foods. A common form of food anaphylaxis is the skin eruption that follows the eating of strawberries by people who, during the course of digestion, are unable to discharge from their systems through the excretory channels certain waste products of metabolism. Other common foods known to cause similar disturbances are egg, pork, milk, wheat, spinach, and shellfish. Immunization against an offending food may be established through the gradual administration of small and increasing amounts of the offending food over a long period of time. The offending food may often be determined by skin tests.

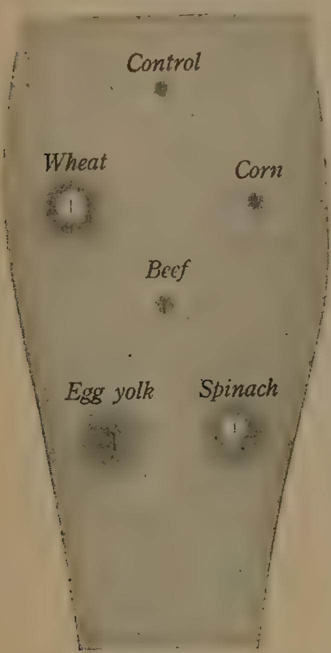



FIG. 51. A skin test for hypersensitivity to foods

Point marked "control" indicates slight scratch made in the skin. Into the other openings powdered foods have been introduced. The test is negative for corn and beef and positive for wheat, egg yolk, and spinach

**115. Elimination.** Elimination of body wastes takes place through the lungs, kidneys, and bowels. Regular and thorough elimination through the bowels is important in maintaining good health.

Proper and daily elimination may be aided through the formation of regular habits. Just as time is set aside for the brushing of teeth, the daily bath, or the washing of hands before eating, so too must time be taken for evacuations.

Directly after breakfast is the best time for this habit. This is essential and must be practiced daily in order to develop regularity. Such a habit developed early in childhood generally continues throughout life. Haste in leaving the home in the morning, thoughtlessness, and resorting to laxative pills and medicines are responsible for the nation-wide disorder known as constipation.

The best advice to one suffering from constipation is to avoid habitual use of laxative drugs. Regular habits of living, time, thought, and a properly balanced diet will do much to prevent and cure this disorder. For a natural, copious, and easy evacuation, lubrication of the intestines and their contents is necessary. Drinking water is helpful for this purpose. Water should be taken upon arising and upon retiring and between meals. Large quantities of liquids taken with meals have a tendency to make the stomach sag. This displacement interferes with the proper emptying of the stomach within the normal four-hour limit.

Certain foods have laxative qualities. Among the most important may be mentioned fruits, vegetables, and cereals. Food which contains a good deal of indigestible material known as roughage is valuable in stimulating the movement of the bowels. Apples (with the skin), figs, prunes, raisins, grapes, and berries are recommended. Raw and stewed celery, spinach, cabbage, carrots, lettuce, raw and stewed tomatoes, and potatoes with the "jackets" (skins) on are valuable as laxatives. Ordinary white flour with the roughage removed is naturally constipating. Cracked wheat, corn meal, Irish and Scotch oatmeal, and bran, all of which contain the outer part of the grain, are desirable in the diet. For the same reason bread made of bran, rye, and whole wheat, and graham bread should be in the diet. Exercises that involve the abdominal muscles play a prominent part in the regular evacuation of the bowels.

**116. The business of eating.** Eating is a business, and should be conducted along strictly scientific lines. Success in business, as in health, is due to a thorough knowledge of one's needs. The suggestions in the paragraphs below will help to make a happy and healthful business of eating.

FIG. 52. A public eating place should always be clean and attractive

Food handlers in this establishment possess health certificates. (Courtesy of the Georgian, Incorporated)

Make eating a banquet event, not so much from the standpoint of how much you will eat, but with reference to what you will eat, how you will eat it, and the preparations you make before eating.

Wash the hands and face before eating. Tidy up a bit. Change your clothes if possible. It helps to relieve the tired feeling.

Three meals a day, with regular intervals, are sufficient, and never eat between meals. The reason for this is that it takes the stomach at least four hours to empty its contents. Anything added at irregular intervals delays the emptying time and interferes with the digestion of the food at the succeeding meal.

Think of food directly before eating. This will help stimulate the flow of gastric and intestinal juices and prepare the stomach for the food that is about to enter.

Clean the mouth before eating. This stimulates the appetite and is considered good hygiene.

Avoid eating alone if possible. Invite a friend. Eating with others buoys up one's spirits, makes the meal enjoyable, and aids

FIG. 53. A clean, sanitary kitchen is essential to health

Courtesy of the Georgian, Incorporated

digestion, particularly if conversation is bright and cheerful. When eating at home with the family, make it a practice to tell a humorous story and have the other members of the family take their turn.

Take time to eat. At least thirty minutes should be devoted to breakfast, forty-five to luncheon, and one hour to dinner or supper.

Food should be thoroughly masticated. Improperly masticated food throws an extra burden on the stomach. Indigestion and other alimentary disorders may follow failure to observe this advice.

Clean table linen and clean eating utensils add zest to the meal.

Members of the family should discuss the menus for breakfast,

luncheon, and dinner at the beginning of the week so that a variety of foodstuffs and well-balanced diets may be formulated.

Water in small quantities may be taken with meals. It should be tasted and not gulped or used to wash down food. The saliva should be used to soften food to facilitate easy swallowing.

Cheerfulness should prevail at mealtimes. With the advent of the radio, dinner music may be enjoyed by all.

Condiments should be avoided, particularly if attention is given to the selection and preparation of food.

Great care should be taken to select clean food. Do not be careless and contaminate it with foul teeth. Carious teeth and malocclusion are incompatible with thorough mastication and good digestion. Consult your dentist, particularly if digestive disturbances are present.

Eat food to nourish the body and to maintain health, but do not gormandize. Think of food in terms of fats, proteins, carbohydrates, mineral salts, vitamins, and water. To avoid obesity and malnutrition work out a caloric table for your individual needs, governed by your height, weight, age, and the nature of your employment. Weigh yourself at regular intervals.

### *For Informal Discussion in Class and at Home*

1. How do the living cells of the body get the energy with which to do their work?

2. What is meant by "calories"? Make up a balanced diet to meet your daily individual caloric requirements.

3. Why is iodine an important element of our diet? Name some of the more common foodstuffs in our daily diet that contain iodine.

4. What common articles of diet have been found especially valuable to prevent anæmia?

5. Of what importance is calcium? Name some foods that supply it.

6. Is it true that if a child has all the food he wants he will not suffer from disturbances of nutrition?

7. What is your weight? Compare it with the number of pounds you should weigh for your height. Do your height and weight correspond to the normal for your age?

8. Prescribe a balanced diet for those children in your class who are underweight. Weigh and measure them at the end of one month; after six months. Observe the improvement in health.

9. Besides considering diet, what other factors should be thought of in treating undernourished children?

10. Name the alphabet of nutrition. Under each of the vitamins outline a table of common foods containing them.

11. What nutritional disorders follow in the wake of absence of vitamins in our diet?

12. In cooking foods what precautions should be exercised to preserve their vitamin value?

13. Write a menu for your school lunches to include all the items of a balanced diet. Discuss the matter of balanced diet with your mother. Observe the lunches of your fellow students during the school lunch period. On the basis of your present knowledge what good and bad points did you observe?

14. Give a three-minute talk on the subject of "The Business of Eating."

# CHAPTER X

## STARTLING DISCOVERIES IN PHYSICAL AND MENTAL DEVELOPMENT

**117. Glands and their secretions.** Have you ever strolled through a circus menagerie and seen the freaks? There is the fat woman, who is nineteen years of age and weighs three hundred and fifty pounds. There is the tiny Tom Thumb, who is thirty-three years old but is only thirty-two inches high. How the giant towers up more than eight feet tall! Why are these people so different from others? There have been different theories, but the one most commonly accepted is, "Well, it's a queer freak of nature." Have you ever wondered why a child grows and then, for some reason, stops growing? How does it happen that you seem to be so much stronger when you are angry? Superstition and tradition give a variety of answers, but science says that everything has a cause. One of the scientific reasons for some of the phenomena noted above is the character of the glandular secretions produced by different individuals.

*The duct glands.* The first kind of glands that scientists discovered were glands with tubes, or ducts. Every gland is a collection of cells which secrete a juice or liquid. A classical example of the secretion of the juice or liquid is the salivary glands, which manufacture saliva. The microscope has shown us that every gland is a chemical factory in which the cells are the workers. The product of the gland is its secretion. Thus the sweat glands of the skin secrete the perspiration, the lachrymal glands of the eyes secrete the tears, the

liver secretes the bile, and so on. Each of these glands by means of a tube, or duct, pours its secretions on to the surface of the body or into some body cavity. Such glands are known as the duct glands. Their function in the life of human beings is now pretty well known.

*The ductless glands.* Little more than a hundred years ago it was noticed that certain organs, such as the thyroid in the neck and the adrenals over the kidneys, which hitherto had been neglected because their function was obscure, had glandular structure; that is, that the cells of such familiar glands as the tear glands or the sweat glands resembled the cells of these more mysterious structures, the adrenals and the thyroid. This discovery was a result of the perfection of microscopy. The reason why these other organs had not been classified as glands was that they possessed no visible pathways for the removal of their secretions. Now they are set apart as the *ductless glands*, the glands without ducts, as contrasted with glands normally equipped with ducts. Since these glands were observed to have an exceedingly rich supply of blood, the blood presented itself as the

Pacific & Atlantic

FIG. 54. The long and short of it!

The circus is in town. The greatest feature is the "World's tallest and shortest man." This chapter explains why such freaks exist

only conceivable mode of egress for the secretions packed within the cells. The name now applied to the glands *with ducts* conveying their secretions to the exterior is "glands of external secretion." The glands *without ducts*, the secretions of which are kept within the body, absorbed by the blood and lymph, to be used by the other cells of the body, are called the glands of internal secretion or the endocrine glands.

There are certain terms for the glands of internal secretion which are used interchangeably. They are spoken of as the endocrine glands, from two Greek words meaning "to separate within" (that is, the "internal secretion"), and as the hormone-producing glands. Endocrine is the more convenient word, as it stands for both the gland and its secretion. Hormone, from the Greek word meaning "awake" or "excite," applies to the internal secretion of the gland and not to the gland itself.

The activities of the endocrine glands are concerned with growth and nutrition, and thus with all development and ultimately with the mental equipment of the individual, with his character and personality.

**118. The chief endocrines and their work.** It is only recently that the significance of the endocrine glands and of the substances they manufacture has become recognized. The principal organs or glands of internal secretion, those whose functions are best understood, are as follows:

Thyroid gland
Parathyroid glands
Pituitary gland
Pineal gland
Suprarēnal or adrenal glands
Islands of Langerhans of the pancreas

There is evidence that each of these organs yields an internal secretion or hormone that, distributed through the

blood, exerts important chemical influences upon other more or less distant organs and tissues. In general, it may be said that the endocrine glands have influence on the following:

Size of the body
General build of the body
General family characteristics
Rate of growth in childhood
Eruption of teeth in childhood
Fat deposition
Ability in studying and learning
Choice of manner of amusement and play
Date of change of voice and growth of beard in the male

Some of these influences have been definitely determined, but it will be a long time before all of them will be well understood. The knowledge that has been gained concerning the thyroid, the pituitary, the suprarenals, and the islands of Langerhans give promise, however, that continued research will gradually enlarge our information regarding influences exerted by each of the glands of internal secretion.

Our knowledge of endocrine functions has been variously derived, partly through observations of disease and partly through experimental work on animals. There is a consensus of opinion that the glands of internal secretion are functionally interdependent. There is a constant interchange of forces among them. In the interglandular arrangement it is not infrequent that when a gland does not seem to be working properly it will be compensated for, or its function will be thoroughly assumed, by another gland or set of glands.

A review of some of the interesting facts concerning a few of the best-understood endocrine glands follows.

**119. The thyroid gland.** This gland consists of two masses of tissue connected by a strip of tissue, astride the windpipe. The position of this gland is well known, because it is

FIG. 55. The child at the left is a cretin; at the right is shown the same child after one year of thyroid treatment. What changes do you see?[1]

enlarged in the case of a disease known as goiter. Its most important secretion is thyroxin, of which the most important element is iodine. This gland seems to have much to do with the amount of energy put forth. Either marked underactivity or overactivity of the gland results in abnormal conditions affecting the health.

[1] From N. B. Foster, "Diseases of the Thyroid Gland," Nelson Loose-Leaf Living Medicine, Vol. III, by permission of Thomas Nelson & Sons.

One result of undersecretion in the thyroid is known as cretinism. This congenital disease is characterized by the absence or the diminished activity of the thyroid gland, diminutiveness of size (midgets), thickness of neck, shortness of arms and legs, coarse hair, prominence of abdomen, large-size thighs, thickness of lips, large tongue, and imbecility or idiocy. It occurs endemically in the goitrous districts of Switzerland and sporadically in other parts of Europe and in America.

When this condition is acquired in the adult, it is known as myxœdema. All the vital activities slow up. The symptoms of this latter condition are practically identical with those seen in the infant and the young child, except that the condition comes on during adult life.

In both cretinism and myxœdema improvement in mental and physical conditions may be brought about by giving the patient an extract called thyroxin. This must be continued throughout the life of the affected individual.

Overactivity of the thyroid gland gives rise to the condition known as exophthalmic goiter, Graves's or Basedow's disease. There is a speeding up of the vital activities. This condition is characterized by an abnormal prominence or protrusion of the eyeballs, associated with an enlargement of the thyroid gland, palpitation of the heart, tremor, extreme nervousness, loss of weight, itching of the skin, and muscular weakness.

**120. The pituitary gland.** This gland is about the size of a pea and has two lobes. It is located on the under surface of the brain. It has two secretions, bringing about a variety of effects. Overactivity of one of these secretions causes an abnormal growth of the body, known as gigantism. The giants at the circus are doubtless the victims of such a disturbed function of the pituitary gland. Insufficient secretion of one or both parts of the pituitary is believed to be responsible for

retardation of growth, as seen in dwarfs. Underactivity is sometimes characterized also by an excessive development of fat.

**121. The adrenal glands.** These glands are just above each kidney. They produce a secretion called adrenalin. This profoundly affects the action of the heart, lungs, digestive system, muscles, and nervous system. The conditions which produce anger, fighting, and flight call forth these secretions in abundance. There is a dilation of the blood vessels in the voluntary muscles that are about to act. The stimulus of the adrenalin causes the liver to give up some of its glycogen, making additional energy available for the use of the muscles. The clotting power of the blood is also increased to prepare for any accident that might result from the arousing of an emotion.

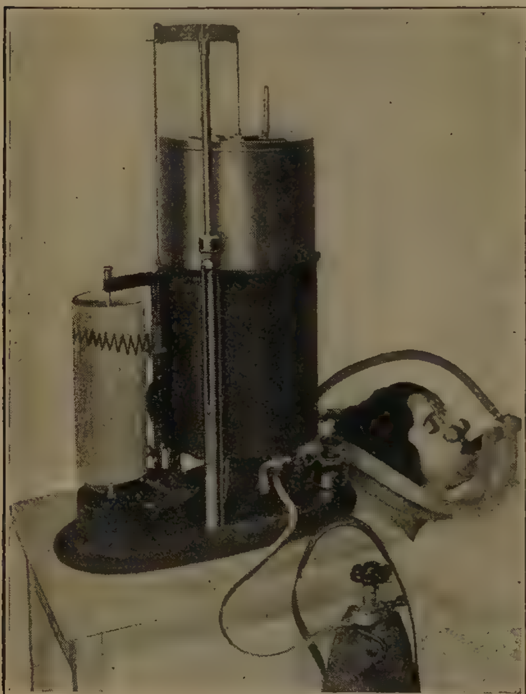


FIG. 56. A basal-metabolism tester

This instrument tests whether or not the patient's malady is caused by the thyroid gland

**122. The discovery of insulin.** One of the most brilliant discoveries in medicine in recent years was made by Dr. F. G. Banting and his associates. For some time it had been known that most cases of diabetes were caused by a lack of internal secretions from the pancreas. The function of the pancreatic juice in digestion was well understood, but it was evident that

there was still another secretion which had not been identified by science. This was finally associated with portions of the pancreas called the islands of Langerhans. Under the leadership of Banting it was discovered that insulin, an extract made from the pancreas of animals, would relieve diabetic patients and, while not effecting a cure, would allow them to live in good health indefinitely. Thousands of lives are saved through this discovery.

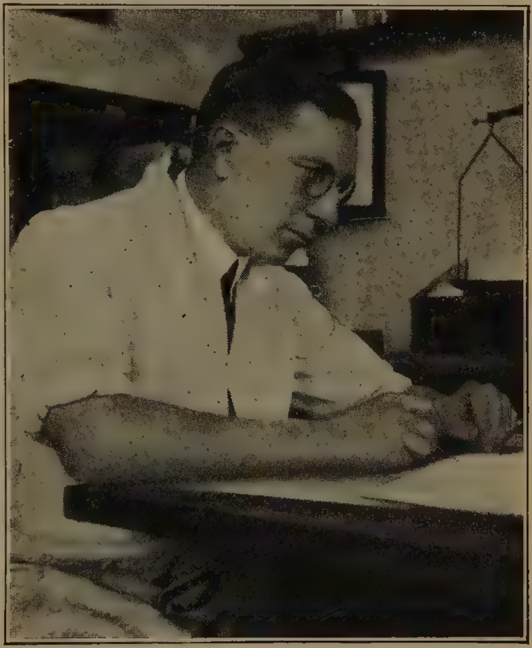


FIG. 57. Dr. F. G. Banting

A benefactor of mankind. His discovery of insulin has made life happier for thousands of people suffering from diabetes

**123. A word of caution.** The new developments in the field of internal secretions have captured the imagination of the public, and most extravagant promises are presented by the manufacturers of patent medicines, such as the growing of hair on bald heads, the restoration of youth to the aged, and so on. These promises, like many others made by patent-medicine manufacturers, are deceptive, and the drugs they sell may be dangerous to health. It is always best to rely on the advice of a reliable physician. Everything indicates, however, that the new science of endocrinology is opening up new points of view which may in certain respects revolutionize medicine and hygiene. It is now one of the most fertile fields in experimental medicine.

*For Informal Discussion in Class and at Home*

1. What glands make people grow tall or keep them short? Is the result of abnormality of those glands limited to change in physical growth? Illustrate.

2. Name and describe the physical and mental conditions resulting from the abnormal development of glands of internal secretion.

3. What chemical agent is used to prevent simple goiter? Which foods contain this chemical?

4. What internal secretion is diminished or absent in cretins? How can it be furnished by a physician?

5. Of what use in medicine and surgery is the extract obtained from the suprarenal glands?

6. Locate the various glands of internal secretion in the body. Visit your butcher and have him demonstrate them.

# CHAPTER XI

## FUN IN PLAY, WORK, AND REST

**124. Enjoyment of play.** It is natural and easy for little children to get fun from their play; they play as naturally as they breathe. But as they grow older, unless they continue to mingle with their companions and learn to play particular things, such as skating, football, baseball, croquet, tennis, fishing, boating, playing in amateur theatricals, and so on, they are likely to lose their interest in play and even to find it distasteful. At a little past middle life a man who had forgotten how to play, in the midst of a successful business decided to retire and to play at farming and at golf on a country estate; but when he tried the experiment he was so unhappy that he returned to his business and subsequently had a nervous breakdown. That was the penalty for not learning how to play. The way to cultivate and keep this interest alive is to participate in play activities. The person who has learned to play has a source of satisfaction in life that helps him to tackle his work with enthusiasm.

**125. Fun in work.** There are some people who think that it is a huge joke to talk about work. It seems to them that work is something that everybody is glad to escape. This, of course, is true of everybody at times. When we have more than we can do, when work is of a character not suited to our interests, when we are not in the right physical and mental condition to pursue our tasks, then work is something that we would gladly be rid of. But a complete escape from work would be a tragedy. All the great men and women who according to history found enduring satisfaction were those

who believed in and enjoyed their work. Robert Louis Stevenson wrote, "I know what pleasure is, for I have done good work." None of us would really like to have our summer vacation continue indefinitely. We welcome with keen satisfaction the day when we can grapple with the problems of school and work.

In the field of mental hygiene the healing power of work has been emphasized. Forel, a noted Swiss physician, found that those having mental disorder were often cured by giving them interesting tasks. Vocational activities introduced into our own hospitals have shown similar results. The introduction of work into schools for the feeble-minded has made them places of happiness and content. The gospel of work means joy, fun, and satisfaction. We need to cultivate the feeling of satisfaction in the thought that we are able to work and find new ways to make our work interesting. Victor Hugo said with truth, "He who scorns work as a pleasure must take it as a punishment."

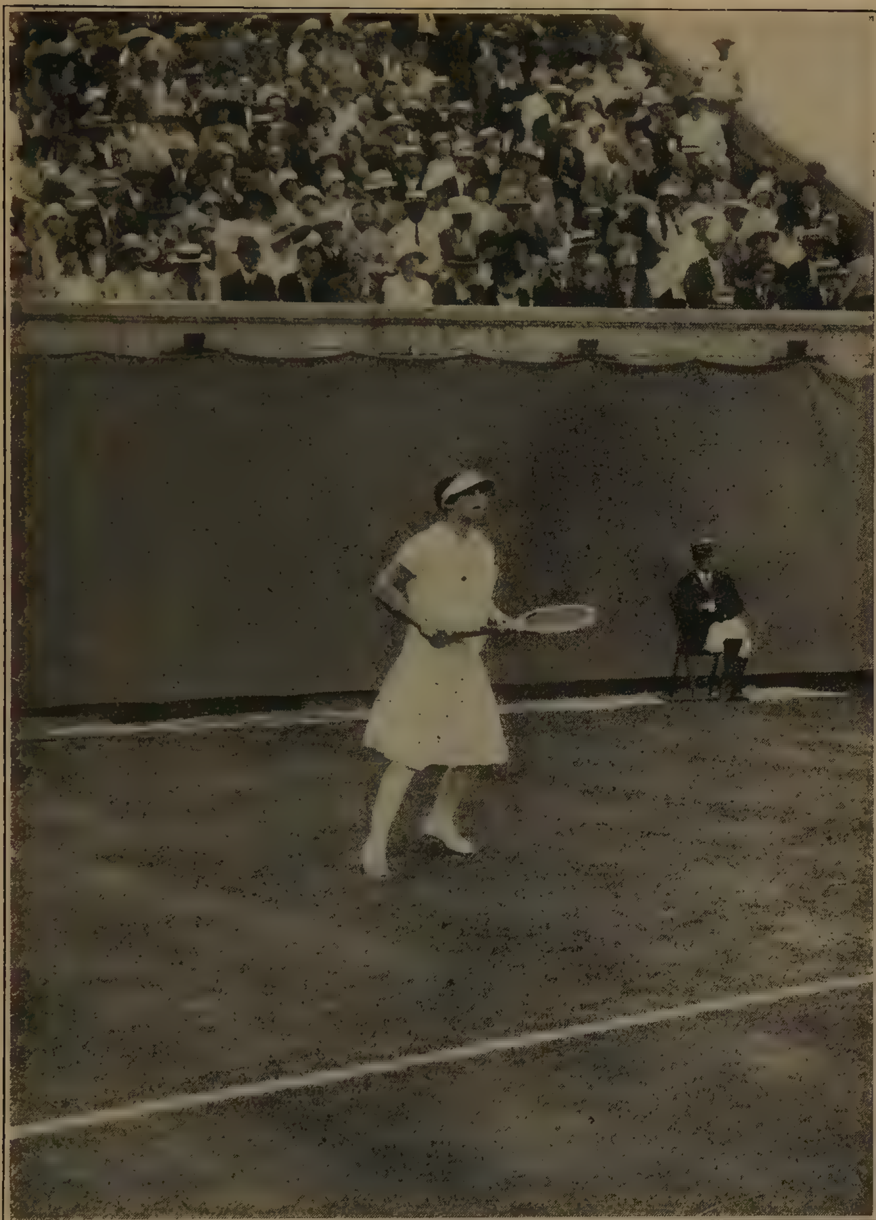
Well might we join Charlotte P. Gilman in these lines:

> To keep my health;
> To do my work;
> To live;
> To see to it that I grow and gain and give.

One of the major problems of happy, successful living is to know how to spend our energy, a problem to which we now turn, together with a discussion of rest, relaxation, and sleep.

**126. Spending your energy.** Everybody who reads this book has ambitions. Whether you who read will be able to realize your ambitions depends not only on your ability but also in large measure on the amount of energy you spend and the way you spend it.

Many lives have been wrecked because these facts have not been known or have been disregarded. Mr. Chittenden, an



Ewing Galloway

FIG. 58. Helen Wills in action

Wholesome play in the open air promotes physical strength, good posture, an attractive complexion, a happy disposition, and all-round robust health

official under the Lincoln administration, signed one hundred and twenty-five thousand bank notes in seventy-two hours. For three days he worked without any intermission. As a result he was a nervous wreck for the remainder of his life. Experiments which have been made since that time show that he might easily have completed his task without mental or physical injury if he had taken periods of rest. An inquiry into the life of a Vermont farmer who had been brought to a hospital suffering from violent insanity showed that he had spent his energy unwisely. He had been running a dairy farm for four years. During this time he got up at 2 A.M. and retired at 10 o'clock after the work of the day. Rest, sleep, relaxation, good food, and wholesome recreation restored this man to health.

How remote this man's practice was from the ideal of Dr. G. Stanley Hall, who believed that the highest aim of hygiene was for a man "to keep himself always as near as possible at the tiptop of his condition"!

**127. The physiology of fatigue.** No matter what we do, whether we study Latin or play football, energy is expended and a condition of fatigue begins. The expenditure of energy results in the disintegration of tissues and a decreased capacity to do work. This is known as fatigue.

There are several physiological changes in connection with fatigue. First, there is an exhaustion of the carbohydrates faster than the blood can supply them. Work involving the spinal cord and the brain causes a shrinking of the nuclei of the nerve cells. Secondly, the breaking down of the tissues results in the formation of carbon dioxide, sarcolactic acid, and other substances. Thirdly, there is the poisonous effect of sarcolactic acid. This fatigue product passes into the blood and acts as a mild poison. The ability of the nerves and muscles to work is reduced. It has been shown that if the blood from a fatigued animal be injected into another animal free

from fatigue, the latter will appear to be fatigued. The body, through its organs of excretion, works hard to throw off these poisons. As they increase, the fatigue becomes more acute. Fourthly, there is a partial starvation for oxygen in the fatigued tissues. It has been proved by experiment that nerve tissue functions only when oxygen is present.

**128. The symptoms of fatigue.** Although fatigue affects various people in different ways, there are numerous physical and mental symptoms. In the case of physical exercise there may be breathlessness and exhaustion. Mental fatigue shows itself frequently in lack of power of sustained attention, failure of the memory, decrease in the power to think accurately, lack of muscular accuracy in performing some act requiring skill such as playing a violin, general feeling of unrest, and greater liability to outbursts of passion. People who are greatly fatigued often say things and do things that make them ashamed of themselves afterwards.

**129. Avoidance of chronic fatigue.** A certain amount of fatigue at the end of the day is perfectly natural and healthy; in fact, one should accustom himself to work under a certain amount of fatigue. By so doing, one to some extent gains power of resistance. Normal fatigue also lends itself to sound sleep.

One who is working efficiently should find himself refreshed in the morning and fully recovered from his activities of the day before. If this does not happen, there will be an accumulation of fatigue products and a chronic condition of fatigue. In that case many of the symptoms noted in the previous paragraph will tend to become permanent. There may be lack of power to sleep, general irritability, a tendency to worry, and a failure in school work and business.

Some people never work hard enough to discover the higher levels of their efficiency and continue to work on a lower plane than is necessary; others may force themselves far beyond the limits of safety. It is only by experiment that one can deter-

mine what his safety limits are. When fatigue continues to be chronic it is best to consult a physician. Often focal infections, like decayed teeth and diseased tonsils, are causes of fatigue.

**130. Conserving energy by relaxation and rest.** Short periods of relaxation and rest during work relieve the tension and strain on the nervous system and muscles, help to dispose of fatigue toxins, and make study and work more pleasurable and effective. The physiological functions of the body are carried on more or less rhythmically. The heart rests between beats, or it would not be able to do its work. We should take our cue from nature.

Some brilliant experiments in industry show how important brief rest periods are. In one case the record of driving six hundred rivets per day was increased to sixteen hundred. Rest periods of two minutes were established after the driving of every ten rivets. This meant that there were two minutes of rest for every one and three-fourths minutes of work. The length of time that one can work continuously without a decrease in efficiency varies with different people.

Everybody would be benefited by lying down for a few minutes during the day, trying to forget his work, and relaxing every muscle. Not only should there be opportunity for brief periods of relaxation during the day or between working periods but also between the working periods of one day and another. The most complete refreshment should come in sleep.

**131. Sleep for health and beauty.** Except for air, which must be supplied momentarily, and water, which is required after an interval of a few hours, sleep is the greatest need of the body. People have been known to fast for many days without serious injury, but the loss of sleep for even forty-eight hours is attended by serious mental and physical symptoms. The period of sleep is the time for nature to repair the expenditures which the body has made in work and play.

Unless there is sufficient time for sleep there is a depletion of reserve energy. Insufficient sleep leads to loss of weight, irritability, pessimism, and nervousness. Work and play both lose their tang. All life loses its zest. Finer thoughts and emotions are submerged under a crust of fatigue products.

Among high-school students in particular there are often too few hours for sleep. Study, dancing, radio, and general social activities unless carefully directed rob the student of sufficient sleep. Wholesome recreation outside of school hours is desirable, but there should always be a balance between work, play, rest, and sleep. Many a failure in high school can be traced to loss of sleep. The student who complains of always being tired is likely to be the one who does not get enough sleep. A sufficient number of hours of sleep is the basis of health, freshness, vivacity, power, and beauty.

The number of hours needed for sleep varies with individuals. Some require much more than others. The amount needed can be determined by experiment. In general, it may be said that high-school students ordinarily require from nine to nine and a half hours of sleep.

**132. Conditions conducive to sleep.** Going to sleep is largely a matter of habit and may be cultivated like other habits. It is essential that we learn to dismiss every other thought except that of going to sleep. Often going to bed means going to bed to worry or think. We should diligently avoid the tendency to think over all the events of the day when we go to bed. Suggesting to oneself thoughts like "Oh, I am sleepy, my eyelids are heavy; I am drifting off," is often helpful. Probably one common cause of sleeplessness is worrying because one does not go to sleep. The story is told of a physician who was annoyed by the insomnia of one of his patients, and in desperation cried out, "Well, what difference does it make whether you sleep or not!" The patient, catching the spirit of indifference, went to bed and slept soundly. If one cannot

go to sleep readily, the thing to do is to relax the muscles and thus rest until sleep comes.

High excitement before retiring is to be avoided. A warm bath at bedtime is conducive to sleep. We should have enough covering on the bed to keep us comfortable — neither too hot nor too cold. The temperature of the room should be cool, and the air should be moving. Drafts are to be avoided. Light should be excluded as far as possible, and quiet is at all times desirable.

**133. Conserving energy by wholesome recreation.** Many people work so intensely at their tasks that they find difficulty in resting after their regular work periods. They have not formed good habits of rest and relaxation. One way to rest the body and mind is by play and various forms of diversion. Every day one should have a certain length of time for recreation — for play, fun, laughter, amusement, a time to forget the serious matter of study and work. The person who forms the bad habits of carrying his work round with him and taking it to bed with him is eventually doomed to a nervous breakdown and a loss of inspiration and power.

While a change of occupation or activity brings a certain amount of relief, it may not be real rest and recreation. For example, a man who at the end of a hard business week, when he is very much fatigued, spends his week-end in strenuously playing golf returns to his work not recreated but often in a worse condition than before. If he spends as much energy as he did during every one of his working days, he will not profit from it. The reasonable playing of golf sandwiched in between periods of rest, reading, and motoring might have been really restful. Real recreation should give the body a chance to rid itself of fatigue products and give the mind such a change that there is a keen appetite for work.

There are various ways for people to get recreation: reading, boating, fishing, baseball, football, basket ball, photography,

bird study, gardening, attending the theater, dancing, hiking, and so on. Whatever it may be, it should involve a change in both mental and physical activities, and preferably some of it should be in the open air. To be efficient one should be as reasonable in his recreation as in his work.

**134. Fatigue and the feeling of fatigue.** The feeling of fatigue does not always mean fatigue. Sometimes at the close of a long walk, amid novel scenes and in the companionship of worth-while people, there may appear little feeling of fatigue. Muscular tests would show less ability to expend energy. Fatigue is sometimes confused with boredom, lack of interest, the effect of bad ventilation, and similar conditions. When there is a feeling of fatigue under such conditions, it may rapidly disappear when a keen interest is developed.

**135. Trying to do your work efficiently.** Many people become overfatigued simply because they do not use their intelligence in planning their work. For example, they may put off doing their school work until so late that they are compelled to do it under considerable strain and by reducing the number of hours of sleep. One should plan the day so as to get time for recreation and work. Everybody may become more effective in his work by forming good habits.

**136. The importance of the muscles.** We hear so much about the importance of the mind that we sometimes forget that thought would be largely useless unless we had muscles to do things. After we come to a decision in regard to anything, we are called upon to act. It may be only the slight muscular movement involved in making a gesture, in signing our name, or the more strenuous activity in jumping to avoid an accident or kicking a goal in football. We use the muscles to write, to run a typewriter, or even to talk. It is even impossible to stand without the muscles. Analyze any trade, business, or profession, and you will find that muscular activity plays a very important part. The training of the

muscles to obey the mind is therefore very important. When you remember that about half the body is made up of muscles, you realize that their healthful condition is essential for right living.

**137. The requirement of physical action.** One of the most difficult things for a healthy boy or girl to do is to remain

FIG. 59. Health, strength, endurance, training, and will power count in this race

still. Take a watch, time yourself, and see how long you can concentrate and sit perfectly still. Unfortunately our modern system of education requires long hours of sitting and physical inactivity leading to habits that do not encourage physical vigor and physical endurance. The body is so constituted that it demands movement and change of position. Schools have realized this and have planned the curriculum so as to relieve the physical strain brought about by inaction. Two-minute

drill, relief drill, physical training, and athletics are provided in the school program to meet the demands of the body for muscular exercise. Although we are constantly using the muscles in sitting and standing, such movements only relieve fatigue. They fail to provide organic vigor, a necessity for good health.

**138. Organic vigor.** When all the organs of the body have the power to do their work, there is organic vigor. This means that not only is the muscular system fit for vigorous action but also the circulatory system, the digestive system, and the excretory system. The mild movements performed in the classroom do not appreciably influence the function and development of the body as a whole. More vigorous and sustained activities must be carried on if the heart, lungs, muscles, and other organs are to be capable of meeting without injury any reasonable demands made upon them through exercise or work.

Let us observe some of the important effects of exercise.

**139. Physiological effects of exercise.** Exercise affects the entire body. Definite changes take place in the cells and working organs. The temperature in the muscles rises. The muscles increase in size. This can be proved by measuring the upper arm before and after exercise. The lungs are brought into action to get more oxygen and to eliminate the increased amount of carbon dioxide, which increases from threefold to tenfold per minute. The change of food into heat energy is constantly taking place, but this process takes place more rapidly during physical activity.

Exercise makes necessary the repair of the tissues. The digestive organs are stimulated to action, promoting absorption and improving the flow of the lymph and blood in the digestive tract. The balance between repair and waste is maintained by the food we eat; hence the necessity for well-balanced, nutritious foods, properly prepared and eaten. Muscular exercise sharpens the appetite and leads to the eating of more food.

The heart and lungs are stimulated to greater action through exercise. We have all experienced the sensation of breathlessness after a short run. The heart beats faster, and breathing is greatly increased. These organs not only assist in the removal of waste products but are directly concerned in increasing the circulation and in carrying food to the tissues. The flow of lymph which surrounds almost every cell in the body is stimulated, removing the waste products and relieving fatigue conditions. The pumping action of the chest wall causes what is known as aspiration of the chest, which draws the blood and lymph from the arms and legs and abdomen to the heart and lungs for redistribution to the body. The ventilation of the lungs during vigorous exercise is greatly increased, because all parts of the lungs are used. During quiet respiration we do not require the use of all parts of the lungs. The habit of shallow breathing may cause lack of expansion of the upper lobes, the first place where the lungs become infected by tuberculosis.

The circulation of the blood and lymph in the muscles is increased by the alternate contraction and relaxation of the muscles. When the muscle contracts or shortens, the blood is squeezed out, and during the lengthening the blood and lymph are free to flow into the tissues.

**140. Value of rhythmic exercise.** For maintaining the nutrition of the tissues rhythmic exercises are desirable. When a muscle is held in vigorous contraction for more than eight or ten seconds fatigue rapidly sets in, since there is a collection of waste products and the need of repair material. Try the experiment of holding the arm sideways at the height of the shoulder for several minutes. What happens? Now exercise the arm moderately. What happens? Can you tell why it is difficult to remain quiet in the classroom for several minutes? What is the remedy? Can you think of several kinds of rhythmic exercise?

**141. Kinds of vigorous physical exercise.** Vigorous physical exercises may be considered under two classes: (1) those involving a single effort, such as a standing jump, chinning the bar, or lifting a weight; (2) exercises of endurance, consisting of movements, often rhythmical, repeated without the expenditure of great energy for each movement. The hygienic effect depends upon many continuous repetitions. Walking, running, skating, skiing, dancing, and rowing are of the endurance type.

Exercises of effort are valuable in developing strength, speed, skill, mental concentration, and the size of the muscles. Exercises of effort are usually followed by rest. Exercises of endurance affect all the organs and tissues of the body more generally than do exercises of effort. The automatic movements of endurance have great value in promoting nutrition. Rhythmic contraction and relaxation promote the interchange of material between blood and muscle, the blood vessels are enlarged, and the oxygen-carrying power of the blood is increased. The number of red corpuscles in the blood stream may be increased from 15 to 20 per cent by vigorous exercise.

A high-school boy is at the period of life when various organs are undergoing changes with the approach of maturity. The beat of the heart becomes stronger and less rapid. Care should be taken at this time not to overstrain the heart by long-continued endurance activities or exercises requiring great strain.

**142. Fatigue and exercise.** Fatigue is a natural result of exercise, but there is danger in undertaking strenuous exercise suddenly. Exercises involving great effort and endurance should be undertaken only after a period of training. This strengthens the muscles and educates the body to throw off waste products of fatigue, breathing, and so on. Vigorous exercise should be followed by periods of relaxation. Those who are training for cross-country races or distance runs

should rest for several days before the race so that they may fully recover from the effects of practice. It is highly important that every precaution be taken to avoid cardiac strain.

Muscle soreness is caused by the irritation of the waste materials that have not been carried off by the blood stream. The elimination of waste products is assisted by massage and the application of warmth or heat. The universal practice of rubbing and massaging the muscles after exercise is excellent.

By exercising while the body is cold or by sudden strain, rupture of the muscle fibers may take place. The lymph and blood exude into the surrounding tissues. This is accompanied by soreness and swelling. This condition, known as "Charley horse," usually requires several weeks to disappear.

**143. Muscular tone.** The muscles are intended to be ready to act at the call of the will and also to hold the various joints of the body in a normal position. To do this they cannot remain soft and flabby, but are under a slight tension called tone. The tone of the muscle has a great deal to do with the posture of the body. The tone of the muscles which bend the body forward may be better developed through greater use than the muscles which hold the body erect. This means that the muscles on the front of the body exert a stronger pull than those in the rear. This gets the body out of adjustment. The remedy is to increase the tone of antagonistic muscles. In the case of maladjustment special physical exercises are needed to increase the tone of particular muscles. One's program of physical exercise should include physical activities which tend to develop muscular tone in all the muscles of the body.

**144. Practical points for the high-school student.** So far as possible, exercise should be pleasurable. Every student needs to get some sort of physical exercise out of doors every day. Hobbies such as photography, nature study, scouting, and the like, which involve walking, are worth while. Games such

as baseball, tennis, football, are recommended. It should be remembered that simply getting the fresh air, valuable as it may be, is no substitute for real physical activity. Exercise should be taken not only for recreation but also for its physiological effect. For purposes of health strenuous sports are not necessary, but merely strolling about the campus or about town has little physiological value. Exercise should be strenuous enough to bring out perspiration moderately, increase the heart action, and induce deep breathing. Choose those physical activities that will bring into play all the large muscles and not use any one group to excess. A slight feeling of tiredness should follow, but should soon disappear, leaving one feeling better than he did before the exercise was taken.

The only way to be sure of getting daily physical exercise is to plan for it in the same way that you plan to get your mathematics or Latin.

### *For Informal Discussion in Class and at Home*

1. For what reasons is it desirable to be in tiptop condition? What are your problems in conditioning yourself for your work? Do you have abundant energy? Is it easily spent or controlled?

2. Try this: Hold your arm sideways shoulder high for one minute. Follow the experiment by raising the arms in rhythm of a second sixty times shoulder high sideways. Which type of activity produces the greater fatigue? the greater concentration? What lessons can be learned from this experiment regarding the activities of a whole day? Do you tire easily? Do you know the cause?

3. Try this: Keep a very accurate and complete record of your daily activities for a week. Note the time and conditions relative to play, study, work, recreation, meals, and so on. Analyze the week's activities. Can you improve on your program for the next week so as to conserve energy and get better results?

4. Why do the school authorities feel that it is wise to provide the time and space necessary for physical exercise?

5. Make a list of the benefits or pleasures that you derive from your physical activities. List, in order of preference, the type of activities you enjoy most.

6. After a severe illness or a recovery from a fracture of the leg what is the usual condition of the muscles of the body? What does this teach us in regard to the use of our muscles?

7. Why do boys and girls go into training for participation in games, athletics, and sports? Is this advantageous to health? What are the disadvantages of poor training? Are there risks? How may they be avoided?

8. Almost any boy who has no physical defects and is in good physical condition can run a mile in eight minutes. What part of a mile, running at an eight-minute gait, can you cover without strain? Will the right kind of training help you to become organically sound?

9. In the interest of good health why is work desirable? Why are play and recreation desirable?

## CHAPTER XII

### BE UPRIGHT

**145. A story from real life.** Robert Bruce was a freshman at the State University. One morning he presented himself to Dr. Goode with this complaint: "Doctor, something is wrong. I seem to be tired all the time. There are pains that run up and down my back. I am having trouble with my digestion. It is hard for me to do my work. What is the matter?" The physician gave Bruce a thorough physical examination and then, to the surprise of his patient, said, "The whole trouble, Mr. Bruce, seems to be that you do not know how to stand and sit properly."

"Do you mean to say, doctor, that all this discomfort is the result of a simple thing like posture?"

"That is precisely what I mean," said the doctor, "except that I should not call posture a simple thing." He held up a watch. "Suppose I were exceedingly powerful and could press in on this watch and make a dent which gradually became deeper and deeper. What do you suppose would happen?"

"The pressure would injure the works of the watch. It would not keep good time. Finally it might stop altogether."

"Quite right," returned the doctor. "In the same way a human body which is twisted out of shape and is not erect will not allow the vital organs to function properly. Finally discomfort and ill health result. Let me show you how you look." The doctor crossed to the opposite side of the room and held up a chart with two figures on it (see Fig. 60). He pointed to the one at the right. "This is about the way you look."

"Good heavens," groaned Bruce in surprise. "Do I look as slouchy as all that? See how my backbone is twisted. Why, my lungs haven't any chance to expand. I don't wonder that I have pains in my back and at the base of my head. What a sorry-looking creature I am. I will be upright." He stood, drawing himself up to his full height.

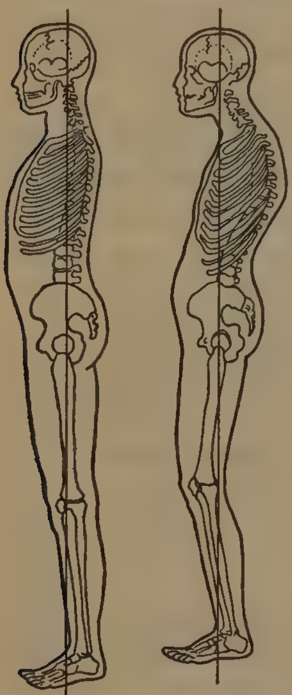




FIG. 60. *A*, excellent posture; *B*, very poor posture

Notice the difference in appearance. Which position offers the greater chance for the work of the lungs and other vital organs?

"Splendid," said Dr. Goode. "Let me help you a little. First stand with your feet parallel and a few inches apart. Hold your head up. Bring the chin in. Your chest should be up. The lower abdomen should be in and flat. Your back curves should be fairly well flattened out."

"There," said Dr. Goode, looking at him in admiration. "If you will learn to stand as well as that, you will soon be well equipped to study, work, and get more enjoyment out of life."

"I will do it," said Bruce.

The best part of this story is that he did what he promised to do. The result was a prompt improvement in his health and personal appearance.

The remainder of this chapter is devoted to the study of those facts about posture which everybody should know.

**146. Posture in the schools.** During an intensive study of posture Miss Jessie H. Bancroft found by testing one hundred and fifty thousand school children in the city of New York that the children in the first two or three grades stand well. From the third grade on through the high school and college the

normal curves of the spine deepen, with the development of round shoulders, protruding head, hollow back, and lateral curvatures of the spine. The story of Bruce suggests that this increasing tendency to bad posture in the higher schools constitutes a real menace to the health and happiness of boys and girls, young men and young women.

In order to understand clearly the difficulties that are encountered in maintaining the good posture so important for

FIG. 61. Good furniture promotes health and a fine figure

health, a brief comparison of the bony framework of the human being with that of the quadruped will be found helpful.

**147. Man and quadrupeds compared.** Anybody who is familiar with the anatomy of animals knows that there is a striking similarity between the structure of quadrupeds and man. From the point of view of posture the most striking thing is the fact that man tends to assume an erect position, whereas the animal goes on all fours. Each position has its advantages and disadvantages. Man has free hands and the greater brain activity which naturally results from such freedom. Man

has his internal organs suspended lengthwise of the body cavity instead of across it as in the quadruped. In a sense this is to the disadvantage of man. His stomach, liver, and intestines tend to sag down, and their weight bears down on the organs lying below them. Thus the upright position shifts the vermiform appendix from the highest point of the digestive

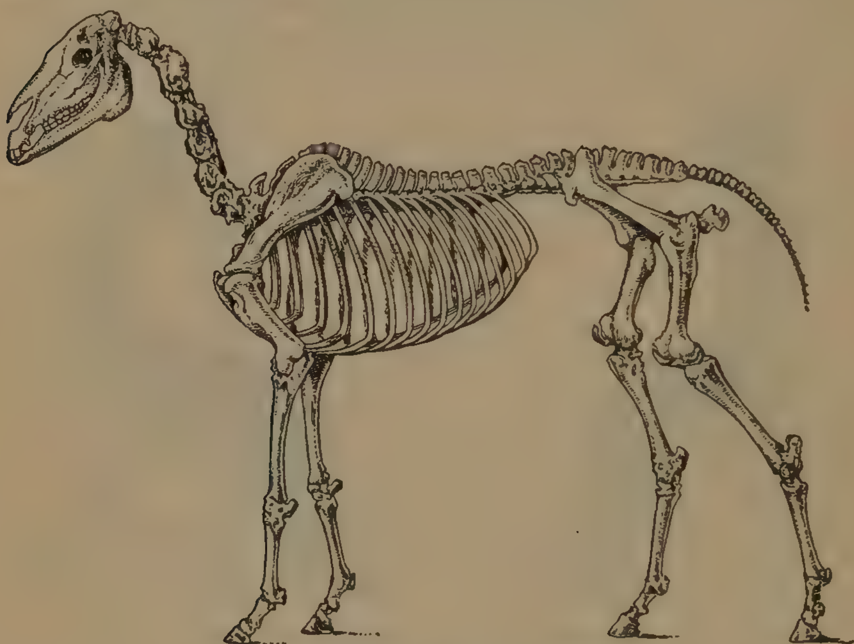


FIG. 62. Skeleton of a horse

The horse has no problems of posture. Why not?

tract in quadrupeds to the lowest in man. This is a decided disadvantage, causing pressure and irritation, often resulting in an inflammation, known as appendicitis.

In respiration man again is at a disadvantage. He must lift the entire weight of the chest. This can be done by muscular action. In the quadruped the ribs and breastbone, or sternum, are suspended, requiring very little muscular effort during the process of breathing. Notice in Fig. 62 that the

quadruped spine is a flat arch and is known as the primitive arch. The internal organs are suspended without crowding by cords, or ligaments, from the spine. The quadruped easily maintains his equilibrium on account of the broad base, supported by the fore and hind legs. The human being has but two bases of support. This complicates the problem of balance and equilibrium. The maintenance of the right relationship of the parts of the body to each other is also more difficult.

FIG. 63. The proper balance of the muscles keeps the body erect

**148. Development of the curves of the spine.** As the child grows the shape of his spine changes. In the newborn infant the spine is in a position of flexion and corresponds to the primitive arch. This curve continues until the child attempts to hold the head erect, when the curve in the neck or cervical region is formed. As the child attempts to stand and walk, there develops a compensating curve in the lower back, called the lumbar curve.

The results from this spinal adjustment are four curves (see Fig. 64), as follows:

*Cervical curve*, extending from the first to the seventh vertebra. The curve is convex forward.

*Thoracic curve*, extending from the second thoracic vertebra to the twelfth thoracic. The curve is concave forward.

*Lumbar curve*, extending from the twelfth thoracic vertebra to the sacrum. The curve is convex forward.

*Sacral curve*, extending from the top to the tip of the sacrum. The curve is concave forward.

**149. The wonders of the spinal column.** All students of human anatomy are impressed by the remarkable mechanism

of the spinal column. It consists of thirty-three small bones, or vertebræ, so adjusted to each other as to admit of great flexibility. Notice how the back may bend when one is engaged in playing basket ball or tennis. Probably the most striking illustration of flexibility is shown in the contortionist of the circus, who is able almost literally to tie himself in a knot. Yet this spinal column which may bend almost like rubber is capable of bearing a heavy burden. Witness, for example, the hod carrier who carries the hod of mortar up a sharply inclined ladder to a tall building. Notice the porter, who sometimes carries a trunk on his shoulders. Such feats are possible only because of the remarkable structure of the spinal column.

The spinal column consists of thirty-three vertebræ. Twenty-four of these form the flexible column. Seven are in the cervical region, twelve are in the region of the chest and are called the thoracic vertebræ, five are in the lumbar region, five in the sacral and four in the coccygeal region (see Figs. 64 and 65). The sacral vertebræ unite and form one bone. The same is true of the coccyx. Each vertebra supports the weight of all parts of the body above it, and it is for this reason that the largest vertebræ are in the lumbar region.

Each individual vertebra has many points of interest which cannot be considered here. Each is constructed to perform its individual work in relation to the whole, in much the same way that the player on an athletic team fits in his activities with his team mates.

Turn to the illustration on the next page and notice how beautifully each of the vertebræ is formed so as to articulate with the one just above and below. The one above in each case is smaller. A place is reserved between the vertebræ for cartilaginous disks. Cartilage is an elastic tissue softer than bone. These cartilaginous disks are firmly attached to the bodies of the vertebræ. The disks vary in thickness. In the

cervical region they are thin, in the thoracic they are larger, and in the lumbar they are thick and resilient. These rubber-like disks give the individual bones a certain freedom of motion, and this promotes the general flexibility of the spinal column. These disks also act as cushions and prevent shock.

Notice also the irregular projections or processes of the vertebræ which on first observation do not seem to serve any particular purpose. These offer a chance for the attachment of the strong ligaments which hold separate vertebræ together. They also provide for the attachment of many muscles.

There is a hollow space in the center of each vertebra. This provides for the spinal cord, which connects with the brain. The individual bones offer protection for the cord, and the spaces in between the bones make possible the entrance and exit of the various spinal nerves.


FIG. 64. The spinal column

One of the most ingenious parts of the human skeleton

**150. The ribs.** The ribs are the chief part of the walls of the chest, or thoracic cavity, which contains the heart and lungs. Suspended from the thoracic vertebræ are twelve pairs of ribs. These, with the sternum and the costal or rib cartilages, form the chest. (See Fig. 65.)

The ribs are attached in the rear to the thoracic vertebræ. The attachment permits of movements which are slight in the first two ribs; but, beginning with the third, the mobility is progressively increased so that the lowest ribs have the greatest mobility. The costal cartilages connect the first

seven ribs directly with the sternum. The eighth, ninth, and tenth ribs are joined to the rib above, but the last two, or floating ribs, are free in front. The costal cartilages, being elastic, are favorable to movement of the ribs.

**151. Other interesting facts about the skeleton.** If you will consult Fig. 65 you will notice the ingenious way in which the spinal column is supported. Observe the queer-looking hip, or pelvic, bones, often called innominate ("nameless," because of their lack of resemblance to anything). These two bones meet in front. They articulate behind with the lower part of the spinal column, called the sacrum. The latter separates these two bones and forms the keystone to the arch. In this way is formed a large basin of bone called the pelvis. The pelvis contains the bladder and other important organs. It also helps to support the stomach and intestines from below.

Further study of the skeleton shows that the skull is balanced on the cervical vertebræ and held in position by ligaments and muscles. The bones of the lower limbs support the weight of all parts of the body above. The bones give the body shape, help protect the vital organs, and serve as levers for the attachment of tendons and muscles.

**152. The joints.** Wherever two bones meet, there is a joint. The joint is held together by bands of connective tissue. Some joints have little or no motion. For example, the bones of the skull have fixed joints. They are remarkable because they fit into each other by toothed edges called sutures.

Other joints are movable. Take, for example, the joint at the knee caused by the joining of the femur and tibia. The heads of the two bones are covered by cartilage, which makes possible the gliding of one bone over the other. Membranes at the joint secrete a fluid which helps to lubricate. Joints like those at the keen and elbow, which move only in two directions, backward and forward, are called hinged joints. Joints like those formed by the femur and hip bone are called ball-

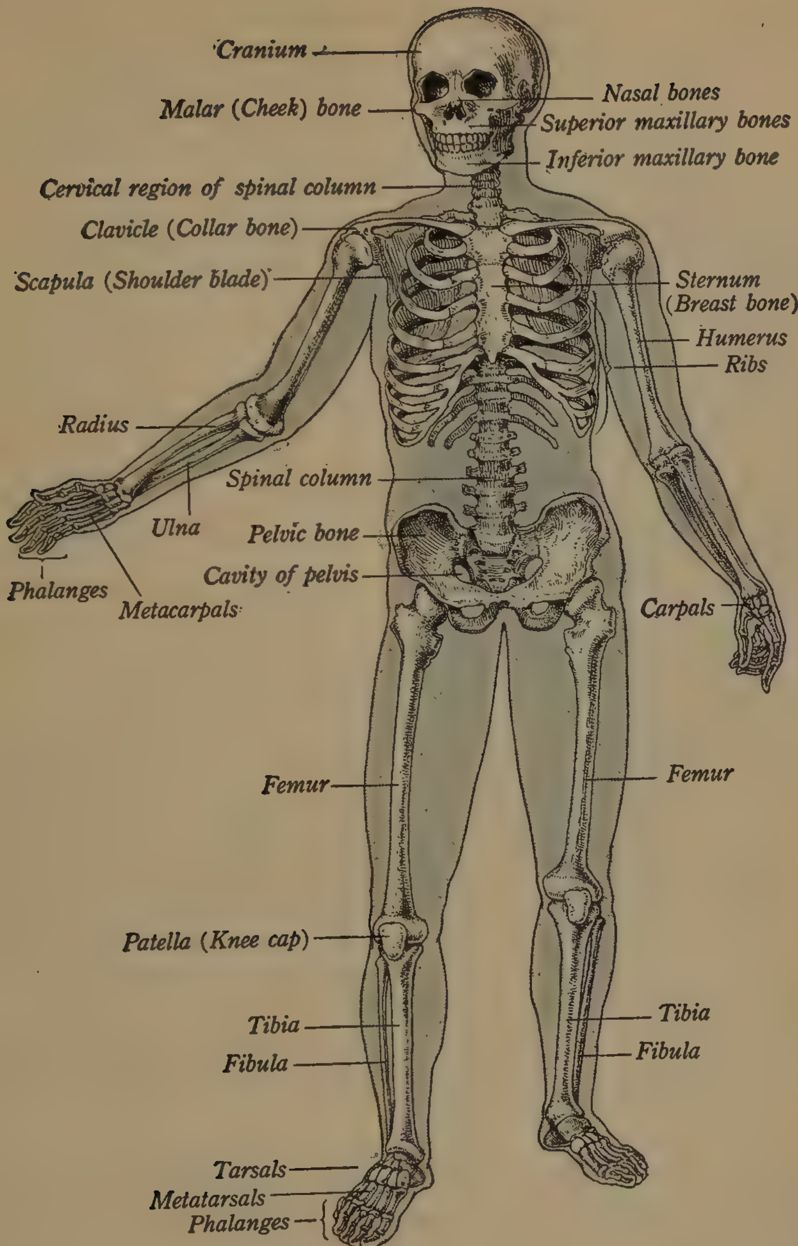



FIG. 65. Skeleton and outline of the human body

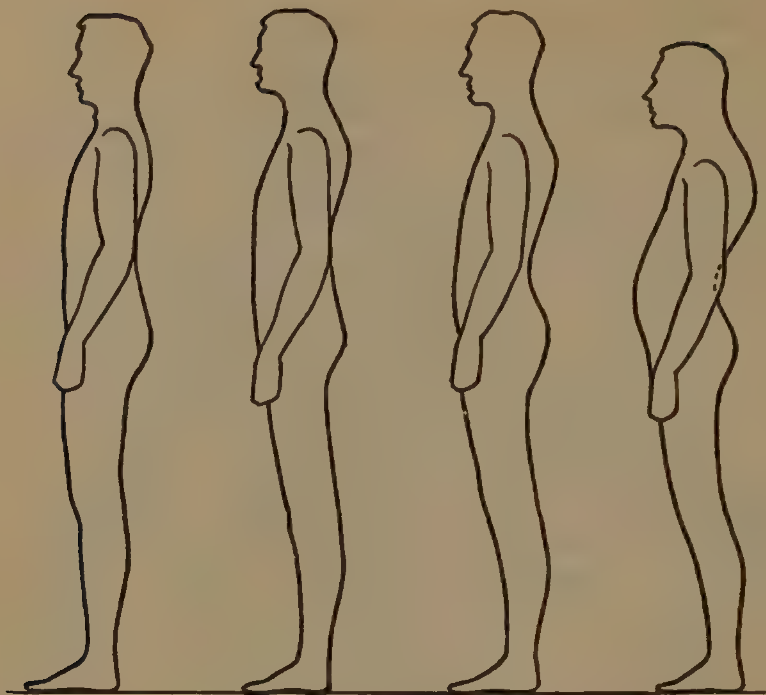



FIG. 66. Tracings made during an examination of 700 Harvard freshmen

Group *A* (7.5 per cent; good mechanical use of the human body): (1) head straight above chest, hips, and feet; (2) chest up and forward; (3) abdomen in or flat; (4) back, usual curves not exaggerated. Group *B* (12.5 per cent; fairly good mechanical use of the human body; note changes from Group *A*): (1) head too far forward; (2) chest not so well up or forward; (3) abdomen very little change; (4) back very little change Group *C* (55 per cent; bad mechanical use of the body; note changes from Group *A*): (1) head forward of chest; (2) chest flat; (3) abdomen relaxed and forward; (4) back curves are exaggerated. Group *D* (25 per cent; very bad mechanical use of the body; note changes from Group *A*): (1) head still farther forward; (2) chest still flatter and farther back: (3) abdomen completely relaxed, "slouchy"; (4) back, all curves exaggerated to the extreme. Consult your instructor in physical education and find out whether you are an *A*, *B*, *C*, or *D*

and-socket joints. They permit of great variety of motion. In the hand and foot the tarsal and metatarsal bones form gliding joints.

Muscles attached directly to the bones or by cords, called tendons, contract and relax and so cause motion.

**153. Essentials of good posture.** There are at least two things necessary for good posture. Study them carefully.

First, there must be a normal skeleton without defective bones or ligaments. It is apparent that a shortened leg, a malformed pelvis, or a defective spine will throw the body out of adjustment. The ligaments round the joints must also be constructed so as not to hinder the normal movements and motion of the joints.

FIG. 67. The way this man would look if he stood the way he usually sits

Play the game with your friends by asking them unexpectedly to stand without changing the curves of the back and neck; have them walk to a long mirror where they can survey themselves. Have them try the same trick on you. What does it show?

Secondly, there must be symmetrically developed muscles capable of holding the body positions. The skeleton cannot of itself stand erect. The body is balanced in the erect position through the action of the nerves and the muscles. The muscles are arranged in pairs. One set serves to bend a joint, and the other set to bend it back to its former position. Thus there is one set of muscles that allows the body to bend forward, and another set that pulls it back to an erect position. If

the tone, or contractile power, of antagonistic muscles of the body is even, the body will be perfectly balanced. The stooped-shoulder position is due in part to the lack of balance between the breast muscles, that pull the shoulders forward, and the back muscles, that draw the shoulders back (see Fig. 63). Until this difference in balance is corrected, the defect will not be overcome.

FIG. 68. Excellent posture at the age of eighty-five

This veteran of the Civil War has a figure which younger men might envy. Wholesome living and proper health habits from early youth permit him to enjoy an active and happy life

Without muscular tone good posture is impossible. Nobody who lacks the power to hold himself erect will be able to assume or maintain good posture. The stronger the muscles the less will be the effort. The excess effort not needed for good posture may be expended in play and work.

**154. Good posture promoted by healthful living.** Anything that contributes to general good health also helps good posture. Bones, muscles, nerves, and general bodily conditions are affected by the food we eat, by the water we drink, by sleep, rest, recreation, and serious disease. Posture is also largely a matter of forming good habits of sitting and standing.

Posture is a symptom as well as a cause of general bodily conditions. For example, bad posture may be the result of too little food or improper food. Muscles cannot have proper strength unless they are well nourished. Bones cannot maintain their firmness and bear the weight of the body unless

they have the proper constituents. Notice the many bony deformities in cases of rickets. On the other hand, food may not be properly digested and absorbed if the vital organs are interfered with by improper posture. One serious condition associated with poor posture is sagging, or ptosis. Weight, or gravity, is tending all the time to bring this about. It affects the head, chest, lungs, heart, liver, stomach, intestines, and in reality all the organs and tissues. If this tendency toward sagging is not counteracted it will result in poor posture and general ill health. If the bones are in good condition and the muscles in proper tone through healthful living, ptosis may be prevented or even cured.

Good posture is usually a sign of excellent health and the possession of such mental qualities as courage and self-reliance.

Although exercises are often useful in furthering good posture by correcting bad muscular habits, such exercises are worthless if the individual does not conform to the practice of the general rules of health. If an individual has bad health habits — eats improper food, fails to get sufficient sleep and rest, etc. — no amount of corrective physical exercise will be worth while. There is scarcely a case of poor nutrition which can be corrected by exercises alone. However, when poor posture is due to lack of vigor and poor nutrition, games, dancing, and rhythmic exercises are favorable to the stimulation of the appetite and the response of all the organs of the body, especially if taken out of doors. Know

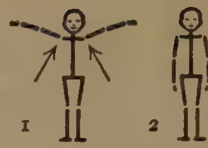
**155. Exercises to promote good posture.** *All exercises should be taken with the emphasis upon elevation of the various parts of the body: holding the head up, chest up, waist up, sitting and standing tall.*

The overextension, if it does not distort the relation of the body parts, may be used to gain complete contraction of the muscles involved.

The following adapted exercises are suggested:

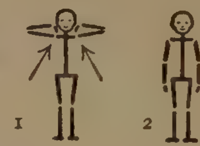
*A. Raising arms sideways*

1. Raise arms sideways, hands at height of eyes, palms up.
2. Arms down, maintain good posture.




*B. Touching hands on shoulders*

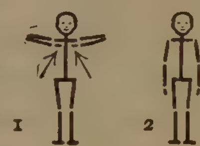
1. Place finger tips on shoulders, wrists high, elbows up.
2. Arms down, maintain good posture.




*C. Bending arms at shoulder level*

1. Bend arms, hands at chest, elbows sideways.
2. Arms down, maintain good posture.

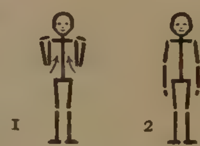
The principal effect of *A*, *B*, and *C* is to anchor the upper angle of the shoulder blade to the spine, toning up and shortening the supporting muscles and stretching the muscles in front of the chest.




*D. Touching hands at sides of shoulders*

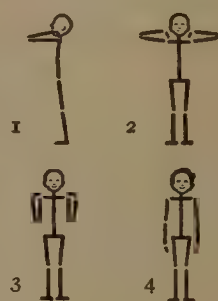
1. Touch hands at sides of shoulders, elbows down.
2. Hands at sides.

The shoulder blades should be retracted and pressed together, so as to develop the muscles between the shoulder blades.




*E. Combination of exercises*

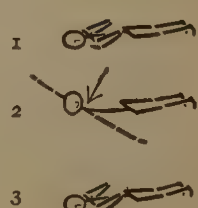
1. Raise arms forward and upward, touching hands on shoulders, elbows up.
2. Press elbows sideways and outward.
3. Press elbows downward to side of chest (hands remain on shoulders).
4. Arms at side.




*F. Extending arms sideways*

1. Starting position, lying on floor, face downward, hands under shoulders.
2. Extend arms sideways, raise head.
3. Return to starting position.

These exercises are especially adapted for developing the shoulder retractors.



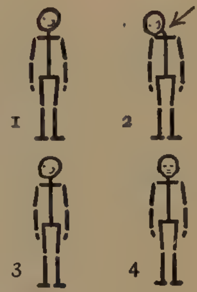
*G. Neck exercises*

1. Head extension: extend head backward, pressing chin in.
2. Press chin in and raise head.


*H. Head rotation*

1. Turn head to the right.
2. Touch chin to shoulder (do not raise shoulder).
3. Raise head.
4. Turn head forward.

These exercises should be done slowly.




*I. Abdominal exercise*

(Starting position, trunk bent forward, hands on knees.)

1. Contract abdomen by pulling it in and up.
2. Relax.

This exercise should not be done rapidly. Combine this exercise with abdominal breathing, gaining an effect upon the abdominal wall, and a vigorous position of the chest.

**156. Points to be remembered.** The facts on posture summarized in the following paragraphs are to be remembered:

The well-balanced body requires an expenditure of a minimum amount of energy. It also permits the vital organs to function with little difficulty or strain.

The effect of poor posture is lessened power to work and play. It causes crowding down upon the organs in the abdomen, thus interfering with circulation and proper function.

The influence of gravity is to cause a sagging of the organs and tissues of the body. To overcome this tendency is the first law in the correction of poor posture.

General good health tends to promote good posture. Ill health and the practice of bad health habits favor the development of poor posture.

Poor posture may be due to forming bad habits of standing and sitting.

Few cases of posture can be corrected by exercise alone.

Participation in vigorous games helps to give tone to the muscles.

Systematic physical exercises may do much to prevent bad posture and to cure it.

### *For Informal Discussion in Class and at Home*

**1.** Why is it difficult for some boys and girls to hold their bodies erect? To what extent does good posture depend on the proper development of the bones? To what extent does it depend on the muscles? How does the mind affect posture?

**2.** Do athletes, ball players, gymnasts, and sportsmen always assume good posture?

**3.** Do we ever speak of the posture of quadrupeds? Why, or why not? How does the posture of quadrupeds differ from that of the human being? Which is more difficult? Why?

**4.** Describe the most common defects in posture. What may cause the defects? Can they be corrected? If so, how?

**5.** Ask one or more of your friends to observe your posture in the schoolroom and on the street. Ask them to report to you from time to time. What are your defects in posture, if any? How may they be corrected? Let the observation go on. Try to improve and get better reports.

**6.** Prepare a talk of five minutes on the value of good posture.

**7.** Tell the class what good posture is, and demonstrate, or ask somebody else in the class to demonstrate, the points involved.

**8.** Consult Armin Klein and Leah Thomas, "Posture Exercises," Publication No. 165, United States Department of Labor; and Armin Klein, "Posture Clinics," Publication No. 164, United States Department of Labor. What helpful suggestions do you find for yourself in these bulletins?

# CHAPTER XIII

## ON YOUR FEET

**157. Other stories from real life.** Did you ever stop to think that much of our life is spent on our feet? No part of the body is more important for the proper enjoyment of play, recreation, and work. If you have ever been compelled to wear new and ill-fitting shoes for an entire day, you will appreciate this fact. Foot troubles, such as corns, bunions, calluses, ingrowing toenails, weak arches, and a number of other disabilities that cause pain, are usually the result of ill-fitting shoes.

The more we know about the feet, the more we are convinced that the person without foot difficulties is rare and that less than half the people of America wear shoes that fit well.

When Uncle Sam called millions into service in the World War 85 per cent of those examined were found to have foot troubles of one kind or another. Most of these people could have had better feet if they had worn better shoes. That does not mean more expensive shoes but better-fitting shoes.

In 1925 a survey of the fit of shoes was made at the Wisconsin State Fair. One thousand persons of all ages and of different walks of life had their feet examined by means of an X-ray machine. The results were as follows:

| | Good Fit | Fair Fit | Poor Fit |
|---|---|---|---|
| Men . . . . . | 40.00 per cent | 46.00 per cent | 14.00 per cent |
| Women . . . . | 14.07 per cent | 55.02 per cent | 30.91 per cent |
| Boys . . . . . | 45.00 per cent | 27.05 per cent | 27.05 per cent |
| Girls . . . . . | 32.09 per cent | 40.59 per cent | 26.49 per cent |

To understand and prevent foot troubles we need to know more about the anatomy of the feet.

**158. The foot a marvelous mechanism.** The foot is one of the most interesting parts of the body. It is composed of twenty-six bones. These bones are irregular and held together by over a hundred ligaments. They are controlled by many muscles. Study Figs. 69 and 70 and notice that there are two principal arches in the foot. These two arches are almost at right angles to each other. The longitudinal arch extends from the heel to the ball of the foot; the transverse arch reaches from the ball of the foot to the underside of the foot just back of the little toe. In addition to these arches there are other smaller arches. If you think of these arches as bows, the bones being the wooden part and the muscles and ligaments the bowstrings, you will see that this ingenious mechanism provides strength for the support of great weight, elasticity for graceful movements, and cushions for shock. The pole vaulter makes use of this delicate mechanism in landing on his feet; the dancer, in the subtle movements of the modern dance; the soldier, in carrying his heavy pack.

FIG. 69. Longitudinal arch of foot

Notice the ligaments (*a*, *b*, *c*) that are like strings to a bow


FIG. 70. Cross section of the foot showing transverse arch

This extends from the ball of the foot to a point just back of the little toe

**159. Flatfoot.** A common foot ailment is that of the fallen arch, or flatfoot. When excessive shock or pressure is exerted or the tone of the muscles relaxes, the weight tends to spread the longitudinal arch and stretch the ligaments which support the foot. The transverse arch may finally be affected. The flattened instep projects inward, causing a bulging on the inner line of the foot. Weight is transferred to the surface of the bones that are not intended for such use, causing pain and the crippling of the feet. One of the first symptoms is a pain under the arch and up the back of the leg. Investigation shows that about 18 per cent of high-school boys have flat feet and about 25 per cent have partly flat feet.

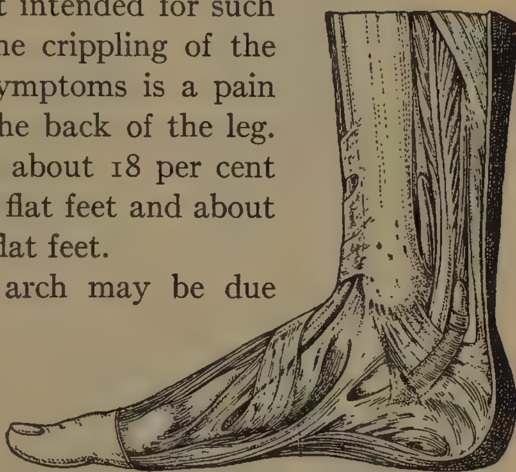


FIG. 71. Tendons that support the arch of the foot

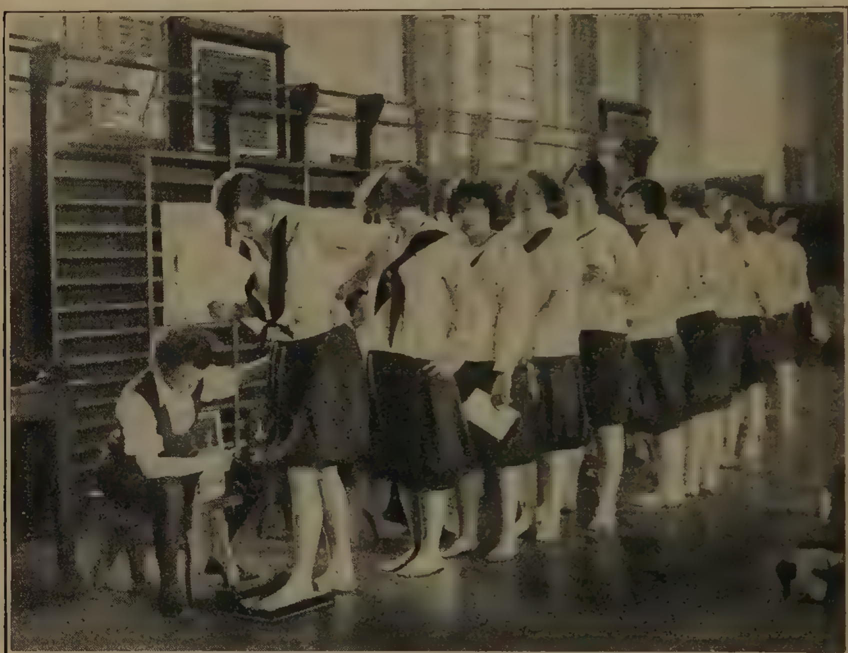
The breaking of the arch may be due to the shock of jumping or of landing on hard surfaces. People who are in occupations requiring them to be on their feet a good deal but allowing little activity are likely to have flatfoot. Among such people are clerks, waiters, barbers, nurses, motormen, and policemen. The muscles and ligaments lose their tone because the parts of the foot fail to contract and relax by motion. The strain becomes too great.

A common cause of flatfoot, or fallen arch, is toeing out. The toes should always point straight ahead. This enables all five toes to be active in giving the body a forward push. The weight of the body is brought squarely over the longitudinal arch.

Flatfoot may not always be irritating or painful, but it is usually a physical handicap. A few people are born with flat

feet and apparently suffer no distress from them unless they are called upon to do an unusual amount of work on their feet. People whose feet become flat get tired after a little walking or standing and then suffer pain.

**160. Foot trouble not confined to the feet.** Unfortunately, pain and distress in foot troubles are not usually limited to



Wide World Photos

FIG. 72. Are your feet in good condition?

These girls are having prints made of their feet in order that faults may be detected and corrected

the feet. Many serious disorders have their origin in the feet. Among these are backache, continued fatigue, poor circulation, and nervousness. When your feet hurt, you hurt all over. Under such conditions it is obvious that it pays to take care of the feet.

**161. Wearing the right kind of shoes and stockings.** Since most troubles with the feet arise from improper footwear, the

selection of shoes and stockings is very important. The following suggestions will be helpful:

*Get a shoe large enough for the foot.* The shoe should not be tight and barely able to hold the foot when at rest. It should be large enough to contain the foot without restriction when you are standing. There should be free movement of the toes in the shoe, not only to prevent the toes from crowding each other and producing corns but also to keep the foot strong through exercise. Tight shoes cause needless suffering.

FIG. 73. What do your footprints show?

Five months' improvement in a girl's feet is shown above. The foot, to begin with, was turned (see prints at left), the arches had fallen, the joints were enlarged and the toes cramped. Class and home exercises and correct shoes brought about the improvement

*The shoe should correspond to the shape of the foot.* The American Posture League has shown that not all feet have the same shape. There are inflare, straight, and outflare outlines. The straight foot should be fitted with a shoe that has a straight line on the inner margin; the foot that flares inward will require a shoe that turns inward at the toes; the foot that has an outward flare will not be comfortable except in a shoe of that last. We should make a study of the shape of our own feet and then see that the outline of the shoes which we wear conforms to that requirement. The shoes should fit snugly around the heel and instep, leaving sufficient room for

the toes. The sole of the foot should be as broad as the foot while standing. Stockings should be large enough so as not to constrict the toes.

*Avoid high heels.* They are responsible for many a sore foot, aching back, and touchy temper. The high heel tends to constrict the toes and throws additional strain on the transverse arch. It is an interesting fact that the Indian, who wore moccasins, never had fallen arches.

High heels cause poor posture. Wearing high heels naturally throws the body forward. If the body were not limber, it would fall. To prevent falling, great muscular effort is expended. The body is tilted backward. Notice the ugly hollow at the waist. This throws the internal organs out of place. The result may be a weak back and an unendurable pain. Some people may wear high-heeled shoes without injury or discomfort for many years or all their lives; but under strain, or during middle life and after, feet and body often rebel against such treatment, and ailments of many kinds develop.

FIG. 74. The difference between these two shoes is a difference between comfort and discomfort, good posture and poor posture, common sense and blind following of fashion, success and inefficiency

The heel should be no more than one and a fourth inches high and should be as broad as the heel of the foot. Rubber heels are advisable, because they absorb shock from hard floors and pavements.

**162. Time and judgment in buying shoes.** Do not depend on the shoe salesman in buying shoes. He is usually more interested in selling shoes than in treating the feet. Ordinarily he will recommend the shoes that are in style. He knows little about the hygiene of the feet. There is probably no kind of

clothing that is so dominated by tradition as shoes. Few shoes are designed for the health and comfort of the wearer. In buying shoes you may purchase comfort or bunions and backache. Be critical and take all the time you need in being fitted.

Do not buy shoes simply because they are cheap. Clerks often make you believe that shoes may be "broken in," but the result is usually unsatisfactory.

When you try on shoes, try on both shoes of a pair. Stand with the weight of the body first on one foot and then on the other. Shoes may feel comfortable when the weight is distributed on two feet, but the shoe may feel quite different when you throw all the weight on one foot.

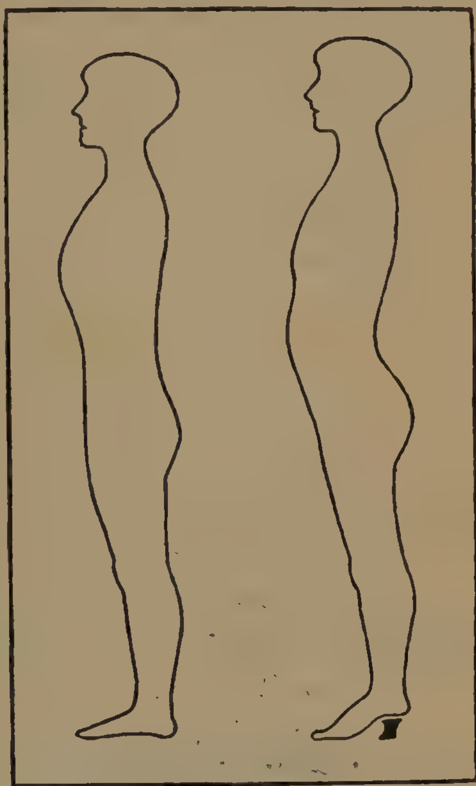


Fig. 75. Write a story of one hundred and fifty words on what these drawings tell

**163. Special exercise for those who tend to have flatfoot.** The principal underlying exercise for the development of the feet is to secure full and complete flexion and extension of the ankle joint. The foot should be rotated downward, inward, upward, and outward in this sequence, over-emphasizing the arch. The toes should be bent downward and upward, and separated. Flexibility of the foot is the keynote.

The toes, as well as the ankles, should be brought into action while walking or running.

The following helpful foot exercises may be taken daily. Repeat these exercises from twenty to thirty times.

Walk with the feet straight ahead, supporting the weight mainly on the outer side of the foot. Walk with foot gripping (Fig. 77).

Sitting with the feet six inches apart and parallel, raise the inner margin of the feet.

(Place six or eight marbles on the outside of the left foot.) Sitting with the feet turned inward, reach across with the right foot

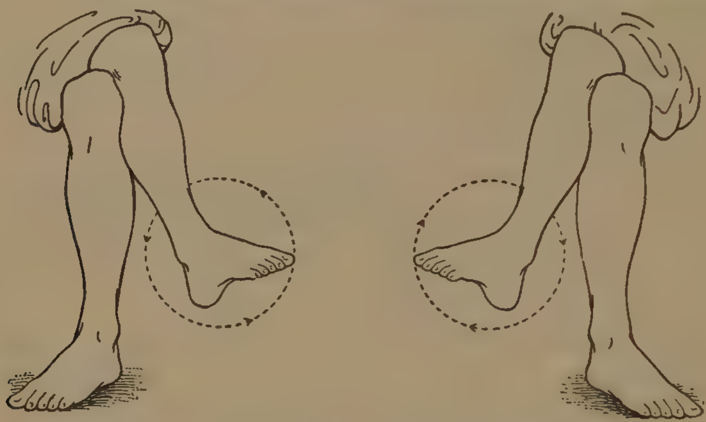


Fig 76. Foot circling, an excellent foot exercise

Sit, right leg crossed over left knee; make circles *inward* with right foot up, *in*, *down*, out, up. Make strong effort on "in" and "down." Alternate left and right; repeat twenty to forty times

on the outside of the left foot and pick up one marble with the toes, place it at the side of the right foot, and continue until all the marbles have been transferred. Repeat with the left foot.

Sitting, cross the right knee over the left knee and bend the right foot downward, inward, upward, and outward. This exercise is called foot circling (Fig. 76). Repeat with the left foot.

Standing, the feet six inches apart and parallel, raise the heels, turn the heels outward, weight on outside of foot. Repeat, walking forward.

Standing, walk forward on the heels, raising the toes upward.

Run in place on the toes, emphasizing the mobility of the ankles by pointing the toes.

Use the toes at all times in locomotion.

**164. Keeping the feet dry.** The temperature and moisture within the shoe play an important part in the care of the feet. The ideal conditions are the same as for clothing of other parts of the body. The feet should be dry, neither too hot nor too cold. Heat produces perspiration, which is absorbed by the stockings; and since wet clothing is a rapid conductor of heat, the feet are easily chilled upon exposure to cold. It is for this reason that rubbers should not be worn indoors. The quality of the leather has a good deal to do with the evaporation of perspiration. Patent and enameled leather hold the moisture and temperature, because they are impervious to water and do not allow for evaporation. These shoes are also cold in winter, because they radiate heat from the surface. Avoid purchasing such shoes.

FIG. 77. Walking with foot gripping, a good exercise for relaxation of anterior arch

Walk with feet apart and parallel on floor; spread toes; pull toes in and under as if taking hold of floor; repeat twenty to thirty times

The problem in the tanning of leather for shoes is to provide a strong, durable covering that is flexible, that will shed moisture, and that will at the same time be porous for the elimination of heat and moisture within. It will be seen that this is a most difficult problem. We can partly meet the situation by changing our shoes several times a week, allowing them to dry out in the interval. The stockings should be changed daily to maintain normal foot conditions.

**165. Treatment of corns, ingrowing toenails, and blisters.** These various foot troubles are preventable. The first thing for any sufferer to do is to remove the cause. Practically every

case can be traced back to badly fitting shoes. When proper shoes are worn these defects will disappear.

A word should be said about blisters. They are dangerous not merely because of pain, but because of the possibility of infection. Broken blisters should be dressed with antiseptics. The site of the blister should be protected for some time after the pain has ceased so as to give the skin a chance to become normal and able to withstand the friction of the shoe. As a precaution against infection, the feet should be kept clean.

### *For Informal Discussion in Class and at Home*

**1.** In an athlete what part of the body is said to wear out first? Is it the heart or the legs and feet?

**2.** Cut out all the illustrations of shoes found in a current magazine or a catalogue from a department store. Count the number of illustrations. What proportion of them were hygienic shoes?

**3.** Of what disadvantage is flatfoot in hiking? in athletics? in middle or old age?

**4.** Why are there so many cases of flatfoot? Could they be avoided? How?

**5.** What causes corns and bunions? Can they be prevented? removed? How?

**6.** What is the danger from blisters? How should they be treated?

**7.** Have a school or class exhibit of good and bad shoes. Let each member of the class grade each shoe or pair of shoes, using E for excellent, G for good, F for fair, and P for poor. Let the class discuss the rating and determine what it should be. How many did you get right?

**8.** Moisten the soles of your feet. Stand on a dry dark surface. Compare your footprints with those in Fig. 73. What do your prints show?

**9.** Prescribe a series of exercises to improve weak or flat feet.

# CHAPTER XIV

## LET US SEE

**166. A new world.** When Theodore Roosevelt was a boy he experienced delicate health. In addition, his mentality did not appear as acute as that of his boyhood chums. For this reason it was necessary to engage a private tutor whose duty it was, among other things, to keep Theodore occupied in the fresh air. He and his tutor spent many hours in the parks and fields, and on one of these occasions it was discovered that young Roosevelt did not fully appreciate a beautiful scene pointed out to him. It dawned upon the observing tutor that Teddy's failure to become enthusiastic over such a magnificent sight was perhaps due to impaired vision. Subsequent examination of his eyes confirmed the original suspicion. His first remark, when glasses were adjusted to his eyes, was, "I never realized that I lived in so beautiful a world as I see all around me." Failure to have recognized this defect early in young Roosevelt's career might have robbed this country of one of the greatest Americans the world has known.

**167. The importance of good vision.** Sight is the most important of the special senses, and the eye the most delicate of man's organs. It is one of the main avenues of knowledge and a channel of communication with the outer world. The eyes have been called the gateway to the soul. By means of normal vision we are made aware of form, color, motion, and so on. Diseases and defects of the optical apparatus, resulting as they may in diminished vision, blindness, and numerous secondary handicaps, demand the most careful attention in the way of prophylaxis and hygiene, particularly

during the early period of childhood. A conservative estimate of the number of children afflicted with eye defects and disorders of vision places the figures between 20 and 25 per cent. Among adults the percentage is even greater. The fact that one does not wear glasses does not indicate that vision is normal; on the contrary, many people who should be wearing eyeglasses fail to make use of them because they may affect one's looks.

**168. Causes of visual defects.** The causes of defects of vision may be classified as congenital, hereditary, and acquired.

By *congenital* causes we mean faulty development of the eyes, or disease or injury of the brain existing at birth. One may have a perfect eye, and yet be blind because of permanent injury of the optic nerve or because of a growth, or tumor, in or near the center of vision in the brain.

The *hereditary* causes do not play as large a part in producing defects of vision in infants as has been formerly supposed, but the tendency to develop weaknesses of the optical apparatus is likely to occur in children whose parents themselves suffer with distinct defects of vision.

The most frequent and important of the *acquired* causes is known as ophthalmia neonatorum, a purulent inflammation of the eye of the newborn, which frequently results in blindness unless carefully guarded against by the attending physician at the time of birth. Practically all cases of blindness in infancy are due to this disease. Its prevention — through the use of silver nitrate in the eyes of all newborn infants — has by law been made obligatory upon physicians and midwives throughout the civilized world.

The public schools are often said to be greatly at fault in predisposing to and actually causing defects of vision. Insufficient lighting, small print in textbooks, glossy paper, reflected light on blackboards, poor blackboards, the use of colored chalk, prolonged and continued use of the eyes without

periods of rest, and a poorly balanced school curriculum are among the more common causes injuring the eyesight of school children. Home conditions, however, are not much better; and since there exist in the home similar and additional causes to predispose to defects of vision, the schools cannot be held entirely responsible.

**169. Mental and physical effects of defective vision.** The child with defective vision is at first completely unconscious of his inability to grasp ideas and situations presented through the eyes. This inability to comprehend visually is a distinct physical handicap and, as such, has a direct effect on the mentality of the child. It is one of the most frequent and important causes of failure to keep up with the normal progress of other children of corresponding age. One of the outstanding causes of the large number of students who either fail or leave high school at the end of the first term is defective vision. From a physical standpoint defective vision has a tendency to cause postural defects, because nearsighted children unconsciously lean forward, and those suffering from astigmatism often twist the neck, in an effort to interpret what is difficult for them to see with ease.

**170. The anatomy of the eye.** The eye is a highly complicated and delicate piece of mechanism. It is both an optical instrument and a sensory organ. The eye may be compared to the camera. Both work on the same principle, as may be seen from the following comparison:

| Eye | Camera |
|---|---|
| 1. Iris and pupil | 1. Diaphragm |
| 2. Crystalline lens | 2. Photographic lens |
| 3. Vitreous humor | 3. Dark chamber |
| 4. Retina | 4. Photographic plate or film |

The lens brings the rays of light from without to a focus on the retina of the eye or on the photographic plate of the camera. The eyeball is a spherical body about an inch in

diameter fitting snugly into a bony cavity in the skull called the *orbit.* This position affords protection against injury from without, and the eye is further protected from dirt and foreign substances in the air by the eyelids and lashes. Additional protection comes through the secretion of tears, which bathe the eyes constantly and keep them moistened. The position of the eyeball in its socket is maintained by a group of six muscles known as *rectus* muscles, which are attached to the bones forming the orbit and to the eyeball itself above, below, to each side, and obliquely. The action of these muscles makes it possible to move the eyes at will in all directions.

**171. The external structure of the eye.** Since the eye is well set back into the head in a bony socket, it is fairly well protected. Nature has also taken other means to protect it. The upper and lower eyelids protect the ball of the eye. Through reflex action these close so promptly when the eye is threatened by an object or by dust that they serve admirably as a protection. The lashes filter dust and foreign bodies from the air. The eyebrows turn the perspiration from the eyes and also protect them. A mucous membrane called the conjunctiva lines the inner surface of the lids.

Ordinary dust is washed out of the eye by tears. Tears are secreted by the *lachrymal gland,* or tear gland, which is located in the upper and outer part of the eye. It is oval-shaped and about the size of a small almond. It secretes tears, to keep the eyeballs moistened and so prevent friction.

The drainage and overflow of tears takes place in the nose through the *tear duct,* which leads from the inner corner of the eye directly into the nose. This drainage keeps the mucous membrane of the nose in a normal, healthful, moistened condition. During the act of crying the overflow of tears drains heavily into the nose.

**172. The internal structure of the eye.** By referring to Fig. 78 you will notice that the eyeball is divided into cham-

bers. One is in front; the other is behind, with a lens in between. The eyeball has three coats: the *sclera*, the *choroid*, and the *retina*.

The sclera is the outside coat of the eyeball. It is the white of the eye — tough, white, and opaque. It completely covers the eye, except at one point where the optic nerve enters the

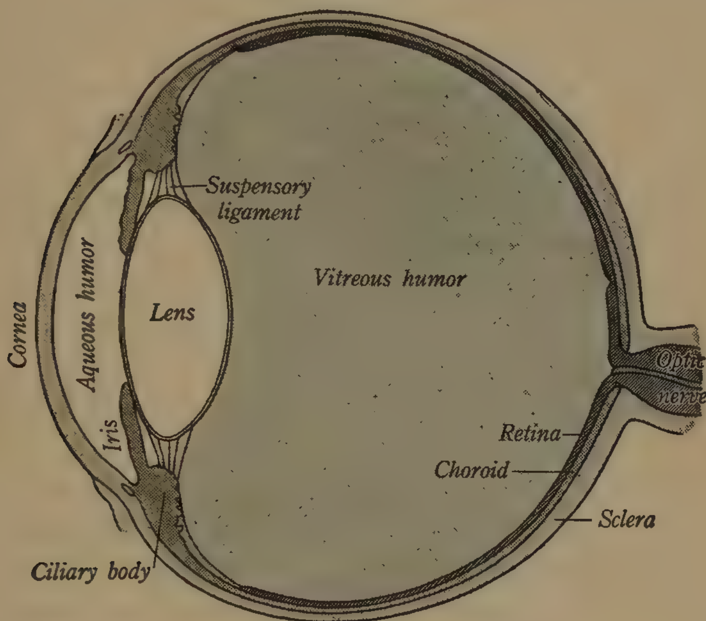



FIG. 78. Drawing showing the different parts of the eye

eye from behind. In the front part of the eye the sclera becomes transparent and protrudes forward slightly, at which point it is called the *cornea*, the window of the eye, through which all rays of light must pass on their way to the brain. In this connection it must be remembered that we see not with our eyes but with our brain. The eye acts merely as a living camera.

The choroid is the middle coat and is thinner than the sclera and more delicate in structure. This black coat prevents light from entering the eye at any point except through the pupil.

It is made up of pigment cells and blood vessels (which enter the eyeball from behind). It covers all the eyeball except that portion called the cornea, at which point it is flattened, thus forming the *iris*, or shutter. The pigment in the choroid coat gives color to the eye — blue, gray, brown, or black. When the pigment is absent, as in albinos, the blood vessels give a pink appearance.

In the center of the iris is an opening called the *pupil*. The pupil always appears black because of the black choroid coat, which shows through the opening. Within the iris is a ring of plain muscular tissue called the *ciliary* muscle, which encircles the opening of the pupil. The pupil becomes large when the muscular fibers dilate and small when the muscular fibers contract. In the act of seeing, just enough light is permitted to come through the pupil to stimulate the optic nerve. The dimmer the light the wider becomes the pupil, and vice versa. The choroid coat prevents the reflection of light in the eye.

The *crystalline lens* is attached at a point where the choroid coat leaves the sclera to form the iris. The lens is convex.

The lens divides the eye into two compartments or chambers: the anterior chamber, which contains the *aqueous humor*, and the posterior chamber, which contains the *vitreous humor*. The aqueous humor is a clear liquid which gives firmness and form to the outer part of the eye and allows rays of light to pass through without obstruction. The vitreous humor is also perfectly clear, but jellylike in consistency.

The retina is the delicate and sensitive inner coat that lines the innermost chamber of the eye. It is the chief structure of the eye, because it is the only part which is sensitive to light. To produce clear vision all images must be focused *directly* on the retina. It forms a screen for the reception of images and has the marvelous power of transmitting these impressions through the nerve fibers of the optic nerve to the brain as

definite sensations. The sensory filaments of the optic nerve are embedded in the retina.

**173. Refraction and accommodation.** Refraction by the eye is its power, when at rest, to focus parallel rays of light on a definite single point upon the retina; accommodation is the power of the mechanism of the eye to adapt itself to vision at various distances. The chief factors of accommodation are the elasticity of the lens and the action of the ciliary muscle. By the action of this muscle the lens changes in shape. As the convexity of the lens is increased, the refractive power of the eye is increased and it is adapted to vision at a point near; and the reverse for long distances. In the normal eye, with the eye at rest, parallel rays of light from without are focused on the retina without the aid of accommodation.

**174. How we see.** When the eye looks at an object the rays are converged by the cornea, pass through the pupil, and are again bent by the crystalline lens, so that they reach the retina, upon which the image is projected. Here a transformation takes place, and the resulting nerve impulses, stimulated by the light, pass through the optic nerve and continue along the visual pathway until they reach a section of the brain known as the *sight center*, where the mind transforms them into sensations of light, form, or color, and the object is seen. The factors involved in vision, therefore, are refraction, accommodation, the optic nerve, and the brain center of sight.

**175. Various forms of acuity of vision.** There are three types of acuity of vision:

*Emmetropia*, or normal acuity of vision, wherein parallel rays of light from without are focused *directly* on a single point upon the retina.

*Myopia*, or nearsightedness, is faulty or diminished acuity of vision wherein parallel rays come to a focus in *front* of the

retina. The eyeball is too long from front to back. This is known as nearsight, common among young people. People with myopia cannot see objects at a distance, although they may be able to see without glasses objects near at hand. The condition is corrected through the use of concave eyeglasses.

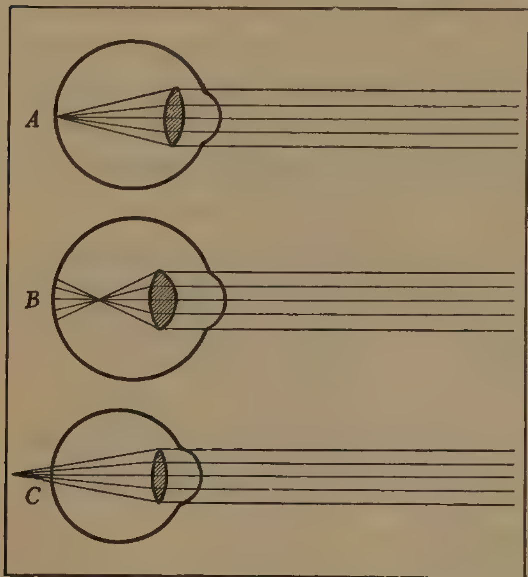



FIG. 79. Diagram showing the various forms of acuity of vision

*A*, emmetropia, or normal acuity of vision, wherein parallel rays of light are focused *directly* on a single point upon the retina; *B*, myopia, or nearsightedness, wherein parallel rays come to a focus in *front* of the retina; *C*, hyperopia, or farsightedness, wherein parallel rays reach the retina *before* they have come to a focus

*Hyperopia*, or farsightedness, is a condition wherein parallel rays reach the retina before they have come to a focus. The image is therefore blurred. Structurally the eyeball is too short from front to back. In cases of presbyopia the lens has lost its elasticity, so that its shape cannot be changed to focus images upon the retina. This condition is frequently met with in older people. Hyperopia and presbyopia are corrected through the use of convex lenses. Farsighted people see objects at a distance more easily than objects near, although they may not see clearly at any distance without an effort. This brings us to the condition referred to as eyestrain.

**176. Eyestrain.** This may be defined as any defect in the refractive or accommodative apparatus of the eye serious enough to give rise to symptoms. The causes of eyestrain

are errors in refraction and poor balance of the muscles of the eye; in the latter case the two eyes move together evenly only with effort. Eyestrain signifies labor, or muscular effort, in the act of seeing and results in discomfort brought on by fatigue. Eyestrain is unquestionably the most widespread of all eye troubles and causes much discomfort and unhappiness. Many failures to achieve success in life have been due to uncorrected and neglected cases of eyestrain. Commonly it causes headaches, most frequently through the eyeballs and radiating through the forehead; nausea and dizziness; loss of appetite and indigestion, with resulting exhaustion; general nervousness, indicated by habit spasm and tics (muscular twitches of the eyes, face, and sometimes arms and shoulders); mental retardation induced through inability to grasp an idea through the visual apparatus. Car sickness is frequently caused by eyestrain.

Persons suffering from eyestrain usually complain of a feeling of distress and an aching sensation in the eyes after reading and after uninterrupted use of the eyes; of headaches, which occur frequently and grow progressively worse as the day passes; also of itching and smarting eyelids. Inspection of the eyes may disclose crusty lids, bloodshot "whites" of the eyes, and recurrent attacks of sties. Oceans of "tonics" are consumed yearly by persons seeking relief for that run-down feeling, evidently caused by eyestrain. Examination of the eyes by an oculist will clinch the diagnosis. The cure lies in eyeglasses.

**177. Astigmatism.** This is a condition due to imperfect curvature of the cornea or of the lens. For convenience of description the cornea may be divided into meridians. If all the meridians — vertical, horizontal, and diagonal — have an equal curvature representing the normal condition, rays of light passing through such a cornea are gathered into a common focus, and the image is clear. This, however, rarely

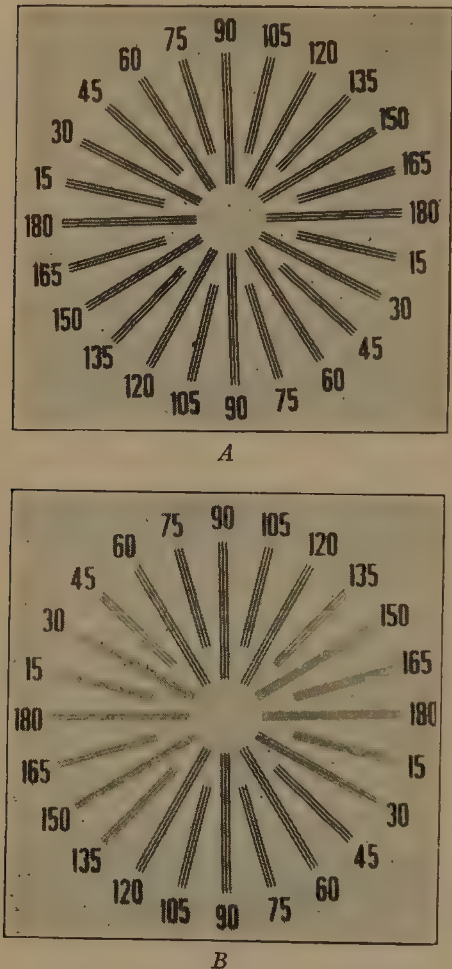



FIG. 80. Astigmatism test-chart

*A*, vertical, horizontal, and diagonal lines, as seen by the normal eye, are clear. This indicates that the curvature of the cornea is perfect in all meridians, thereby permitting combined rays of light to reach the retina at a single focus. *B*, horizontal and diagonal lines, as seen by an astigmatic eye, are blurred. This indicates that the curvature of the cornea is imperfect in those meridians, with the result that combined rays of light will not reach a single focus on the retina. (Courtesy of *Hygeia*)

occurs. In 75 per cent of people one meridian has a greater refractive power over rays of light than the other meridians. The result is that since the rays are not refracted *equally* through all meridians, the combined rays of light will not reach a single, or common, focus; hence the image is blurred. This refractive error is known as astigmatism.

**178. Strabismus.** Normally eyes are held in place and are moved by the rectus muscles in coördinated action. These muscles are controlled by motor impulses sent from the brain along the fibers of the third, fourth, and sixth cranial nerves. Faulty muscle balance of this group results in a constant unnatural effort to keep the eyes parallel. Paralysis or weakness in any single muscle of the rectus group results in a contraction of the opposing rectus muscles, with the result that they fail to act in harmony. Such a condition results in a faulty position of the eyeball, which is

turned from its proper axis, inward or outward. This is known as strabismus, squint, or cross-eye. Paralysis of the rectus muscles is usually caused by diseases such as anterior poliomyelitis (infantile paralysis), encephalitis lethargica (sleeping sickness), diphtheria, and meningitis. In many instances the cause of the strabismus is unknown. It has been known to run in families, where it is due to a defect of vision more serious in one eye than in the other, and where, as a result, there is little or no effort toward binocular single vision. Cures may be obtained through the use of glasses, especially if treatment is begun early in life. With many children treatment should begin as early as two years. If treatment is delayed, operation is the only relief.

**179. Tests for acuity of vision.** It should always be borne in mind that perfect vision does not mean perfect eyes. Normal vision does not necessarily indicate a normal eye. Many children with perfect vision may have errors of refraction of considerable degree, causing red eyes, headache, and other symptoms of eyestrain, all of which may cause a child to be backward in school. Such defects may not be indicated by vision below normal, and can only be detected by one skilled in refraction work. It is important, on this account, that individuals do not get the impression that just because their vision is normal their eyes are free from strain.

At six years the average child is farsighted, a condition which gradually decreases until he is nine or ten, when the tendency to nearsightedness increases. About the period of adolescence (at from twelve to fifteen years of age) the condition of the eyes is likely to be changing, so that through the whole period from six to fifteen years of age the child's eyes and vision undergo a slight though certain change. This emphasizes the need of frequent tests during the school period.

The most desirable solution, one which, it is hoped, may ultimately be realized, is an arrangement whereby every

child shall receive periodically a thorough eye examination by an oculist. Many schools conduct such a health service.

**180. Testing the eyes.** Tests of the eye reveal the acuteness of vision. There are three types of acuteness of vision: (1) normal acuteness of vision (normal vision); (2) diminished acuteness of vision (usually nearsightedness); and (3) normal acuteness of vision plus eyestrain (usually farsightedness). The test to ascertain acuteness of vision is made with the aid of a Snellen Eye-Test Chart (see Fig. 81).

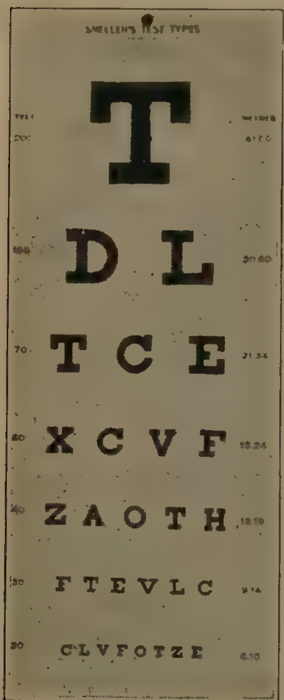



FIG. 81. The Snellen Eye-Test Chart

By following the directions in section 180, one of your classmates can ascertain your acuity of vision

These charts should never be exposed except during the testing of the eyes, as children are apt to memorize the order of the letters. The tests should be made in light rooms. The chart should be hung where it has the best side illumination and on a level with the eyes. The child should stand on a line twenty feet from the chart and directly in front of it.

The numbers in front of each line of letters on the chart indicate the distance in feet at which an eye with the normal acuteness of vision should read the line. The "20-foot line" is the "standard line" and should be read by an eye with the normal acuteness of vision at a distance of twenty feet. A mistake of one or two letters is allowed in the reading of this line.

Acuteness of vision is recorded by a fraction (as, for example, $\frac{20}{200}$ ($\frac{1}{10}$ normal vision), $\frac{20}{100}$ ($\frac{1}{5}$ normal vision), and $\frac{20}{20}$, whole, or normal, vision), the numerator being always 20, the

fixed distance from the chart, and the denominator being the number in front of the line of smallest letters successfully read at this fixed distance.

Each eye should be tested separately, starting with the right eye, the other being completely covered with the back of the hand or with a clean slip of paper not previously used for another person, in such a way as not to press upon the eyeball. The one tested should start at the top of the chart and should read down from left to right or from right to left to avoid memorization. The number opposite the last line successfully read should be recorded as the denominator of a fraction, the numerator of which is uniformly 20. For instance, if the 70-line is the last line read by the right eye (R), and the 100-line by the left eye (L), the record is as follows: R $\frac{20}{70}$, L $\frac{20}{100}$.

A record of $\frac{20}{20}$ (whole vision) indicates normal acuteness of vision (Type 1).

A record of less than $\frac{20}{20}$ in one or both eyes, that is, $\frac{20}{40}$, $\frac{20}{50}$ ($\frac{1}{2}$ and $\frac{2}{5}$ normal vision), indicates diminished acuteness of vision (Type 2).

A record of $\frac{20}{20}$, if accompanied by symptoms of eyestrain, such as cross-eye, habitual headache, weariness after study, bloodshot eyes, crusty lids, is abnormal and is recorded as follows: R $\frac{20}{20}$ (E. S.), L $\frac{20}{20}$. This indicates normal acuteness of vision plus eyestrain (E. S.) (Type 3). The discovery of eyestrain depends upon careful observation.

Children wearing glasses should be tested first without them and the result recorded. *If the acuteness of vision is not appreciably improved by the lenses*, the child should be referred for reëxamination and possible change of glasses.

**181. Common disorders of the eye other than vision defects.** Common disorders of the eye are due to injuries from pens, pencils, toys, broken glass, twigs and branches of trees, chips of stone, cinders, and dust. Excessive light and heat may also be injurious.

There are various infections of the eye that may be troublesome and painful, such as sties, granulated eyelids, conjunctivitis, and pink eye. One of the vicious eye diseases found in the Orient and one which is carefully guarded against at ports of entry for immigrants is trachoma. This is a contagious disease and may cause blindness.

Some troublesome conditions of the eye are systemic, due to pathological or diseased conditions in other parts of the body, which show evidence of their existence in a disorder of the eyes. The cause, however, is not in the eyes. For example, Bright's disease (of the kidneys) may show itself in puffiness of the eyelids and changes in the retina. Arteriosclerosis (hardening of the arteries) results in changes in the optic nerve, an atrophy or wasting away of the tissue. Apoplexy (rupture of a blood vessel of the brain) leads to hemorrhages in the retina. Liver diseases cause jaundiced whites of the eyes; exophthalmic goiter, bulging eyeballs; and diabetes, ulcers on the cornea. It would be possible to go on for several pages to discuss general bodily conditions resulting in eye troubles.

**182. Consulting an oculist.** Inasmuch as the eye is so frequently affected by various diseases in the other parts of the body, it is safest to consult an oculist rather than an optometrist or an optician for diagnosis and treatment of any and all symptoms, referable to the eye, that cause anxiety and discomfort. An oculist, or ophthalmologist, is a licensed physician who specializes in the treatment of all eye disorders. An optometrist is a lay person who is licensed by the state to fit glasses for defects of acuity of vision, but is neither competent to treat diseased conditions of the eye nor legally permitted to do so. An optician is an individual who fills the prescription for glasses as directed by an oculist. Neither the optometrist nor the optician is permitted by law to use drugs such as homatropin ("eye drops") for the dilation of the pupil so as to facilitate examination of the interior of the eye.

Since disturbances of vision are not always attributable to disorders of the eyes, but rather to some abnormality elsewhere in the body, it should not be expected that optometrists or opticians, no matter how skillful they may be in testing the refraction of eyes or in filling prescriptions for lenses, should discover such underlying conditions. Since they are not trained medically they should not be required to make a diagnosis of disorders of the eye as related to the general system. Certainly no one would trust a druggist to prescribe for a disease of the nature of which he was ignorant.

The treatment of eye diseases by unlicensed lay persons has opened up a prolific and profitable field for all kinds of patent-medicine fakers, who offer sure cures to restore failing vision without the use of glasses. The best advice with reference to these fraudulent and worthless preparations is to avoid them. Self-medication is dangerous. Better consult an oculist. The same advice is offered to those who have been in the habit of patronizing the eyeglass counters in stores and to those who purchase their eyeglasses through mail-order houses.

**183. The hygiene of the eye.** The care of the eyes should begin with the newborn child. Directly after the birth of the child silver nitrate should be used to prevent ophthalmia neonatorum. This step is absolutely necessary. In time it will wipe out the main cause of blindness in early infancy. Children with strabismus, or cross-eye, should have the benefit of treatment at the hands of an oculist as soon as the defect is recognized. Young children should have their eyes examined by an oculist before they enter school. These examinations should be followed up each year by the school doctor or nurse, or should be part of the health program of every school. As soon as a visual defect or eye disorder is discovered, glasses should be prescribed and parents should see to it that children wear them all day long. All other disorders of the eye should receive medical attention until the defect

is corrected or cured. The school child is expected to do home work in conjunction with his studies in class. While he is at home his parents should provide proper lighting facilities for him. Such home care will prevent eyestrain and other visual defects.

The school also has its obligation to the child. Books should be provided with sufficiently large type and with paper of neutral tint. Small print and glossed paper should be avoided. Attention should also be paid to the length of the reading line, which should not be more than four and a half inches in length. Teachers and parents should instruct children to hold reading matter fourteen to eighteen inches from the eyes. The child should be cautioned to stop reading when the eyes become tired and when he becomes sleepy. The eyes should not be strained with long-continued and uninterrupted reading. It is a good plan for both children and adults to rest their eyes at least five to ten minutes every hour of the working day. We rest other tired muscles of the body. Why not the eyes? Reading should be avoided in moving vehicles. Before sitting down to read, one should make sure that the light is steady. There should be no shadows on the reading matter. Sit in a position to have the light come over one shoulder. This means that the glare of the light will not fall directly on the eyes. Strong sunlight or artificial light should not fall directly on the reading matter. People whose eyes are sensitive to light should wear tinted glasses. Smoked glasses should be used if necessary during the winter months to prevent snow blindness. They should be worn also to prevent strain on the eyes from bright and direct sunlight. People who use their eyes a great deal during business hours, particularly indoor workers, should avoid straining the eyes after business hours. An oculist should be consulted by adults from time to time to make sure that their eyes are normal. If glasses are necessary they should be worn:

eyeglasses are as beneficial to weak eyes as crutches are to crippled limbs. Children should be taught not to use anything but an individual towel for washing the face and cleaning the eyes. This also applies to a handkerchief, which should never be borrowed to remove dust or foreign bodies from the eye.

**184. Defective vision a cause of accidents.** Poor eyesight is not only responsible for a certain amount of backwardness in school, but it is distinctly related to accidents. The Eye Sight Conservation Council of America tells us that six out of every ten persons have reduced visual perception. This, of course, includes drivers of automobiles. Unfortunately many persons with poor vision do not know that they have visual defects. Since they have always seen objects in a blur or distorted, they think that is the way they should always be seen.

In the interest of public safety all applicants for a driver's license should have eye tests. Such a test might even be so simple as the reading of automobile licenses or street signs at the time the trial for driving ability is given. Those whose eyesight falls below the standard should be refused a license until their eyesight has been brought up to standard. If that proves impossible, the license should be permanently refused. Some of our states and cities are doing excellent work in this field. One company which employs a large number of bus drivers makes semiannual tests of the eyes of its drivers. As a result there are almost no accidents on its lines.

It is very important that men in factories and shops working around dangerous machinery should have good vision. Blurs and distortion in vision are likely to prove elements of danger.

### *For Informal Discussion in Class and at Home*

1. What part of the eye actually does the seeing? In what part of the body is the center of vision located?

2. What happens to your eye which makes it farsighted? nearsighted? astigmatic?

3. Do you realize that headaches, pain in the eyeballs, or fatigue after reading may be signs of eyestrain? What is the remedy?

4. State the difference between an oculist, an optometrist, and an optician. What is the function of each?

5. How do you know whether vision is normal or faulty? How long since your vision has been tested with the Snellen Eye-Test Chart? What is your acuity of vision?

6. Defend the statement that if glasses are necessary they should be worn all the time, as against using them occasionally.

7. Obtain a Snellen Eye-Test Chart from your hygiene teacher and test the vision of your neighbor. Then have him return the favor. Communicate the result to your hygiene teacher and to your parents. If you suspect anything wrong, talk it over with your physician.

8. Do children with strabismus outgrow this defect? Who should be consulted? What remedies are usually advised?

9. Defend the statement that normal acuity of vision is essential to good health, to success and freedom from accidents in industry, to ability in driving an automobile, etc.

10. In which room at home do you study? What are the lighting facilities? Can you improve them?

# CHAPTER XV

## CAN YOU HEAR ME?

**185. Good hearing for happiness and success.** The ear, like the eye, is another window to the soul. What a tragedy it is to lose one's hearing. The child whose hearing fails is greatly handicapped in learning. If he is completely deaf, he must be specially trained to communicate in the deaf-and-dumb alphabet and in lip-reading. If the hearing is partly defective, he is likely to hear only a part of what is said and so misinterpret. Bad speech and poor posture sometimes result from imperfect hearing. Not to hear would mean to shut out of life music, the songs of birds, and the voices of our friends. Not to be able to hear would shut us out of certain trades and professions. The ordinary teacher, engineer, telephone operator, policeman, lawyer, and lecturer must have good hearing. In an age of machinery and automobiles the inability to hear often puts one's life in jeopardy.

The prevalence of deafness in this country is far greater than any of us with normal acuity of hearing have the remotest conception of. As with all other physical handicaps, the gravity of the situation does not interest us until it strikes home. No less an authority than Warren Pond, president of the New York League for the Hard of Hearing, states that there are over five million deaf people in this country who are socially and economically embarrassed because of this serious physical handicap. The cure and prevention of deafness would contribute much to the happiness and success of the nation. Defects in hearing often begin in early childhood.

Defects in the hearing apparatus practically always begin

in infancy and early childhood, when the early signs of deafness are usually overlooked and when disorders intimately associated with the causes of defective hearing are neglected. The hope of many parents is that their children will outgrow such disabilities. This is unfortunate, because ear disorders are not only preventable but curable if treatment is begun at the onset of the trouble. Contrary to general public opinion, deafness does not develop in adult life, but actually begins in childhood — the age of acute upper respiratory diseases and their complications, such as abscesses of the ear.

The first signs of deafness are often discovered when the child first attends school. The school authorities consider this defect of such great importance that classes and schools for the deaf have been established for their early care and training to prepare them for the competitive game called life. Before considering the question of the care of the ears and the prevention of deafness let us try to understand better the physical mechanism of hearing.

**186. Structure of the ear.** The ear is an instrument through which sound is conveyed to the brain, where it registers and gives the particular impression or sensation conveyed. It is divided into the outer, middle, and inner portions, which in turn have subdivisions.

*The outer ear.* The outer ear is a cartilaginous structure, technically known as the concha, or auricle, but commonly called the ear. It catches waves of sound and conducts them through the meatus, which is the opening leading into a passage called the external auditory canal. This canal is about one inch in length, and is closed at its inner end by the drum membrane, or tympanum (eardrum). The external auditory canal is lined with skin in which there are many tiny hairs and innumerable small glands which secrete a wax called cerumen. These protect the drum against dust, irritating particles, and insects.

*The eardrum.* The eardrum is an oval membrane obliquely attached to the sides of the auditory canal, the upper portion being nearer the external opening. It presents a concave surface to the exterior. The eardrum is an important factor in the sense

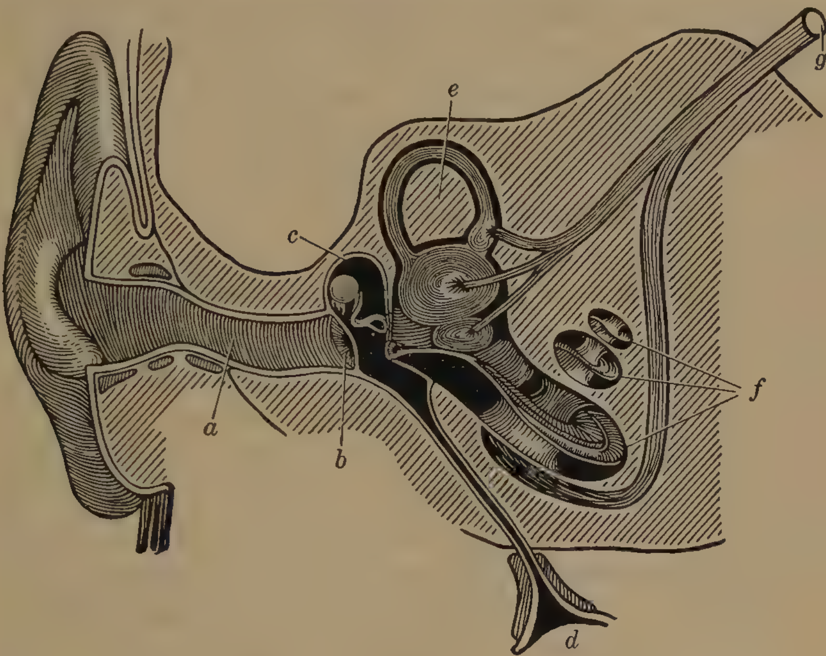



FIG. 82. Diagram of the ear

The process of hearing is as follows: sound waves are caught by the outer ear and are carried into the external auditory canal (*a*) to the eardrum (*b*), whose vibration causes motion in the chain of bones (*c*) of the middle ear, thus magnifying sound waves and transmitting them to the lymph in the cochlea (*f*), in which fluid rest the endings of the auditory nerve. Through the trunk (*g*) of these sensory nerves impulses are conducted to the hearing center in the brain. The semicircular canals (*e*) are concerned with maintaining normal equilibrium or balance of the body. The Eustachian tube (*d*) permits of air passing between the throat and the middle ear

of hearing. It is a delicate structure and is the seat of abscess formation in the ear. If the drum is badly damaged, deafness usually results. For this reason the most expert care should be given the ear in the event of an ear infection. Mothers should learn never to clean the internal ear for fear of

injuring the drum. They should be advised also never to put foreign substances, such as ear drops, into the ear unless advised to do so by a physician. There is an old rule that the only thing that should be put into the ear is one's elbow. When an abscess is present in the drum membrane, it should be opened by a physician under aseptic precautions. When the pus stops discharging, the incision heals, and the drum membrane is practically normal again. The ear should never be poulticed with drops and other home remedies. Such unscientific treatment causes the abscess to come to a head and to discharge, at the same time causing a large hole to be punched through the drum and carrying with it the bones, or ossicles, of the middle ear. This results in a permanent opening, and hearing is lost for all time. If the abscess punctures the drum but does not damage the ossicles, the hole has to be filled in with fibrous tissue instead of normal elastic membrane, and the result is an inflexible scar. Scar tissue does not transmit sound waves as readily as normal drum membrane, and hearing is therefore permanently affected.

*The middle ear.* Beyond the eardrum is a small space or chamber known as the middle ear. It is about one sixth of an inch in length and nearly half an inch in its vertical diameter. It contains three small bones, or ossicles, which because of their appearance are called the hammer (or malleus), the anvil (or incus), and the stirrup (or stapes). The position of these three bones in the middle ear is in the order in which they have been named. They are connected one with the other, and their function is to magnify the sound waves and to transmit them from the drum membrane, through the middle chamber, to the lymph contained within the internal ear. The middle ear is closed externally by the drum membrane, and its inner side is connected with the pharynx (upper part of the throat just back of the nose) by a narrow tube called the Eustachian tube.

*The inner ear.* The inner ear consists of a very small and delicate bony structure called the cochlea, in the form of a spiral canal resembling a snail's shell. This canal coils on itself, and is filled with lymph or fluid in which rest the endings of the auditory nerves. From these nerve endings impulses are transmitted to the hearing center in the brain. The semi-circular canals are concerned with maintaining normal equilibrium, or balance of the body. If certain parts of the internal ear are irritated, one is affected with dizziness or vertigo. It may be irritated mechanically by turning around fast, or from movements of a ship pitching up and down or rolling from side to side, resulting in seasickness.

*The Eustachian tube.* The Eustachian tube runs from the back of the throat at a point on a level with the nose to the middle-ear chamber. It permits air to pass back and forth, equalizes the pressure on both sides of the drum membrane, and prevents straining the inner wall. The function of the Eustachian tube in this respect may be recalled from experiences many have had while riding in a tunnel under water or when making sudden ascents or descents in an elevator. On these occasions the air pressure becomes either increased or diminished, with the result that the drum is pushed in or out, and hearing is temporarily disturbed. The sensation is one of fullness, and the air pressure is relieved upon swallowing. The act of swallowing opens the Eustachian tubes in front and drives air along through the canal into the middle ear, thus increasing the air pressure within to equal the pressure from without. Swallowing also gives relief when the pressure needs to be decreased. It aids the three small bones in the middle chamber to carry the vibration of sound to the inner ear. The Eustachian tube plays a very important part also from the standpoint of disease. It is the connecting link between infections of the tonsils, adenoid tissue, nose, and throat, and the middle ear.

**187. How we hear.** Sound waves enter the external meatus and pass through to the drum membrane, where vibrations are carried by a chain of bones across the middle ear to the fluid in the inner ear. The vibrations are transmitted through the fluid in the cochlea and start the impulses in the filaments of the auditory nerve. From the auditory nerve the impulse is continued to the center of hearing in the brain, where the sensation of sound is recorded.

**188. Causes of defective hearing.** The principal causes of defective hearing center around changes that take place in the middle ear. Here are located the small bones that transmit the sound waves to the cochlear fluid. These important structures are damaged or destroyed through infections caused most frequently by diseased tonsils and by adenoid growths. The swollen condition of these organs causes local obstruction and congestion of blood. The local congestion predisposes to inflammation, which causes a fertile field for the development of bacteria. Once an infection begins in the nose and throat under such conditions, the inflammation frequently extends through the Eustachian tube to the ear, where ear abscesses and mastoid diseases are apt to develop. Scarlet fever, measles, colds in the head, grippe, and sinusitis also predispose to ear infections and subsequent deafness. The most frequent complication of these diseases is ear abscess. If diseased tonsils and adenoid growths are removed early, the tendency to ear disorders is minimized. Early immunization against preventable diseases, such as scarlet fever, measles, and diphtheria, is equally effective.

Foreign bodies in the ear are also sources of trouble and are apt to set up inflammation and subsequent infection. Forceful blowing of the nose is another very important factor predisposing to ear infections, particularly during the course of an inflammatory condition of the nose and throat. Diving and swimming also pay their toll in ear abscesses. A severe

blow on the ear or head may rupture the eardrum and permanently damage the ossicles.

The more common disorders of the ear, from without inward, are frostbite of the ear, erysipelas, furuncles (boils) of the external auditory canal, impacted wax (cerumen), foreign bodies, otitis media, mastoiditis, and deafness. There are degrees of deafness from partial impairment of hearing to total deafness. People may be born deaf, and when this occurs it is associated with mutism.

**189. Earache.** This is a common symptom occurring during the course of acute infections of the nose and throat, and indicating trouble in the middle ear, abscess of the eardrum. It is an indication that there exists congestion of blood in the Eustachian tube and pressure on the drum from accumulation of blood and pus. Earache demands the immediate attention of a physician, particularly one skilled in the care of the ear.

**190. Prevention of deafness.** The prevention of deafness lies largely in the prevention of contagious diseases, and in the early removal of diseased or enlarged tonsils and of adenoid growths and any other factors conducive to nasal obstruction. Special care during the convalescent periods of the acute infectious and contagious diseases is absolutely essential. During the course of these illnesses special attention should be paid to the proper clearing of secretion from the nasal passages. Violent blowing of the nose in an effort to clear it is one of the most important causes that contribute to ear diseases and subsequent defects in hearing. It causes infectious mucous material to be blown into the Eustachian tube. Since it is natural for children to clear their noses when thickened secretion obstructs the nasal passages, they should be instructed to hold the handkerchief about half an inch from the nose and to try to expel the secretion very gently. If relief cannot be obtained in this way, an effort should be made to draw the mucus backward through the nostrils into

the nasopharynx or throat and expel from the mouth. People with a tendency to ear abscesses should not get their heads wet while swimming. Diving should be avoided. Ear canals should never be cleaned with hard or sharp objects, such as hairpins, toothpicks, and pencils.

**191. Consult a physician.** A discharging ear is a sign that an infection exists, and it should be looked upon as a potential case of deafness. It should never be treated without the aid of a competent physician. Neglected ear abscesses invariably develop into mastoid disease and loss of hearing. If there is any suspicion that imperfect hearing exists, an aurist (a physician who specializes in the treatment of diseases of the ear) should be consulted. There are many people with imperfect hearing who are not aware of the defect. If friends suspect it, they should not hesitate to mention it. Imperfect hearing if neglected leads to deafness. No credence should be given the erroneous belief that deaf children and others will outgrow their defects. It is advisable that such people should be examined regularly by a competent physician.

People hard of hearing and deaf people should follow the advice of their physician and should avoid quacks who promise cures with unscientific methods. Deaf people may receive additional aid through perfecting themselves in lip-reading, using hearing devices, and by joining leagues for the hard of hearing.

**192. Testing the hearing.** One who is hard of hearing is likely to lean forward with his good ear to the speaker. Frequently he asks people to repeat their statements. Sometimes he fails to answer questions correctly or to follow conversation intelligently. Under these conditions it is not strange that he often lacks interest in his surroundings. Since one may not know that his hearing is defective, it is a good plan to have one's hearing tested. There are two tests commonly employed: the whispered voice test and the watch

test. Let different members of the class take turns in testing each other's hearing.

In using the voice test stand about twenty feet back of your classmate. Whisper several things to him and ask him to put them down on paper; or ask him to do several things,

FIG. 83. The audiometer

This new, scientific method of testing the hearing makes it possible to test accurately the hearing of large numbers of children at one time. (By courtesy of the American Medical Association)

such as "Hold up your right hand." If care is taken so that no pupil sees what the other does, it will be possible for one person to test several pupils at once.

If you use the watch test, hold an ordinary watch three feet from your classmate on a level with his ear. Vary the distance from time to time so as to find out the greatest distance at which the pupil can hear distinctly.

**193. The audiometer, a new invention for testing the hearing.** The audiometer now offers a scientific method of testing the hearing of a number of children at the same time. A phonograph is installed in the classroom. Arrangements are made

so that each child in the room has a telephone receiver for each ear. The ears are tested separately. When the phonograph is started, the first thing the children hear is: "You are going to have your hearing tested. Write the numbers which you hear in column 1." Then the children hear groups of numbers. The records have been prepared so that each group of numbers is presented with three degrees of intensity. The children are provided with sheets for recording their impressions. The examination of these papers at the end of the test gives very reliable information as to the children's ability to hear.

### *For Informal Discussion in Class and at Home*

1. How do we hear? Where is the center of hearing located?

2. What is the association between acute contagious diseases and hearing? Study carefully the relationship between adenoid growth, nasal obstruction, and defective hearing.

3. Demonstrate the proper and safe way to use a handkerchief in clearing the nostrils. Why should this method be used?

4. Is your hearing in each ear acute? How do you know? Have someone test you.

5. Are you subject to acute "colds" in the head? Do they hang on? Have you consulted a physician, preferably a nose-and-throat specialist recommended by your physician, to determine the cause? Give reasons why such a course will prove beneficial in later years.

6. If one is subject to earaches after swimming, what precautions should be taken?

# CHAPTER XVI

## HAVING A REAL VACATION

**194. Vacations sometimes detrimental to health.** Miss Patricia Jones has been looking forward to her week's vacation. What a relief it will be to get rid of the routine life of the school, and the home study of Latin, mathematics, science, and other subjects which has continued until late at night. She celebrates the beginning of the vacation by going to the theater and retiring very late. She is up late almost every night attending parties and dances. During the day she shops and entertains her friends. She is so worn out when she returns to school that she is in worse condition than she was at the beginning of her vacation. She is very tired, her digestion is upset, and school work does not appeal to her. She has misused her vacation.

The high-school boy or girl who has used judgment and moderation on the vacation returns to school in splendid physical condition and with a keen interest in school work. Such a student has had a vacation in the true sense of the word, for the word "vacation" is derived from *vacatio* meaning "leisure." It indicates a space of time in which there is an intermission of a stated employment; in other words, a holiday. It suggests the act of recreating or the state of being re-created. One who takes a vacation should be recreated physically and mentally so as to resume work with zest.

A vacation should be a kind of health insurance. Not only should it give us pleasure, but it should insure us against sickness, boredom, nervous breakdown, and failure. A real vacation lays the foundation for happiness and success.

**195. Choosing a healthful place for a vacation.** For the recreation of oneself physically and mentally, as complete a change from the routine of daily activities as is practical is desirable. For one who lives inland the seashore is to be preferred, especially during a long vacation. For one who lives

FIG. 84. Swimming, one of the most delightful forms of recreation in summer

This photograph was taken at a summer camp. Notice the precautions taken for safety. There are life preservers in case of accident, and the instructor is giving helpful suggestions for diving

at the seashore a trip to the mountains is to be recommended. Other needs may be satisfied in travel, ocean voyages, camp life, fishing trips, and hunting.

It is always desirable to consider the healthfulness of any locality before selecting it as a vacation resort. It should have a good reputation as to freedom from mosquitoes and from malaria, typhoid, and other diseases. Unfortunately

many of our vacation resorts are patronized only during the summer months and too frequently are questionable from the point of view of health. If you are in doubt, write to your state board of health for a list of approved, healthful localities.

**196. Medical aid and hospital facilities.** Going on a vacation to a strange place is always plunging somewhat into the unknown. This is as it should be, for the spice of adventure helps to make the vacation fascinating. But this adventure should not extend to health matters any more than is necessary. Although one should always expect good health, yet there is the possibility of illness, often sudden and serious illness. No one should ever seek a vacation in a place where medical aid cannot be summoned within a distance of five miles. This is of prime importance to every vacationist.

**197. Physical examination before vacation.** Before going on a long vacation it is always desirable to know that one is in a good physical condition. The dentist should always be consulted for the purpose of clearing up small dental defects which may be troublesome. Do not permit a toothache to mar a pleasant vacation.

If you wear glasses, take an extra pair with you and ask your oculist for a copy of your prescription. You may need it in the event that the original or the extra pair breaks.

If the trip is a long one, visit your physician to secure immunization also against diseases for which you need protection, such as smallpox, typhoid fever, diphtheria, and scarlet fever. This applies particularly to tourists to foreign countries. People have recognized the importance of this preventive treatment and are seeking this protection before taking ocean voyages to foreign lands. It is also well to consult a physician as to diet, recreation, physical activities, and correction of remediable defects.

**198. First-aid kit.** If one is to have an active kind of vacation largely out of doors, it is always a good precaution to

put a first-aid kit in your traveling bag. Such an outfit may be secured at almost any drug store. It should include gauze, roller bandage, sterile absorbent cotton, adhesive plaster, and a local antiseptic, such as iodine or mercurochrome. The greatest care should be taken to keep this material absolutely clean.

**199. Clothing for the vacation.** One should be prepared for sudden seasonal changes and for emergencies. The vacationist usually finds it wise to carry an umbrella, rubbers, sweater, an overcoat, and sometimes an extra pair of shoes.

**200. Choosing a boarding place.** Many a person who has set out on his vacation in high spirits has returned disappointed because he did not choose a healthful boarding house. Inquire as to whether the windows are carefully screened. Are there bathing facilities? Are there sanitary toilet accommodations? Is the drinking-water satisfactory? Does the milk come from a sanitary dairy? Is the milk pasteurized? Are there any cases of contagious disease on the premises? Do the house and surroundings seem clean? Do the meals offer a balanced diet, including a generous amount of fruit and fresh vegetables? Is the place conducive to rest? These are some of the many questions that everybody should ask.

**201. Live out of doors.** To have a profitable vacation, one should spend much time out of doors in the enjoyment of the sunshine and fresh air. Boating, fishing, croquet, horseback riding, tennis, photography, bird study, and all kinds of recreational pursuits out of doors help to give one a health reserve for study and work.

The value of sunshine as a health agent has been recognized for centuries. We did not know the reason for its value until the discovery in 1893 by Dr. Finsen, who showed a scientific basis for heliotherapy. He reported the active principle of actinic, or ultra-violet, rays from direct sunlight. The absorption of these rays through the skin and into the blood is responsible in large measure for the general improvement in

health that occurs during the summer or vacation months. Many people bask in the hot sunshine to get a coat of tan; and all the time the skin is absorbing the ultra-violet rays and benefiting the health, not through the improved appearance caused by a coat of tan but because of the systemic effects of the rays. A good healthy outward personal appearance is an

Ewing Galloway

FIG. 85. Skiing, one of the most exhilarating of winter sports

expression of inward health. Ultra-violet rays have a bracing effect on the blood, tissues, and cells of the body and, through their specific action, increase the calcium and phosphorus content in the blood. This knowledge has led physicians throughout the world to utilize these rays in the treatment of at least two diseases characterized by deficient calcium and phosphorus metabolism; namely, bone tuberculosis and rickets.

In 1903 Rollier, a noted Swiss physician, opened his first clinic in Switzerland for the treatment of bone tuberculosis, making use of direct sunlight with its ultra-violet rays.

Throughout the year he gives sun baths in the open air, with gradually increasing doses of sunlight on the nude body. This method of treatment should be safeguarded by progressive exposure of the body, accompanied by rest, and should always be given under the direction of a physician. In some localities, particularly during the winter months, from October through March, ultra-violet rays are diminished in the sunlight, and as a result physicians have to resort to artificial sunlight in the form of carbon-arc or quartz mercury-vapor lights. The latter is known as the alpine lamp.

**202. Rest and play necessary for a vacation.** Vacation time should be playtime, the time to forget one's work and one's cares. There should be a complete change of activity, interest, and environment so as to restore a tired muscular and nervous system. A vacation should relieve strain on the entire body. There should be not merely a rest for the mind but rest for the eyes, ears, blood, skin, and bowels. A good vacation should relieve the strain on all organs, cells, and tissues and should bring into action muscles, organs, and interests not ordinarily used in the general round of activities. Vigorous muscular activity should always be followed by rest. During the vacation one should endeavor to get more sleep rather than less. Avoid excess fatigue. It lowers the bodily resistance and predisposes to illness and disease.

**203. Continuing practice of health habits.** Too often the vacation leads to backsliding in health habits when it should be a time to get a firmer grip on habits partly formed. This is the time to start to form habits which might be difficult under the stress of regular living. Among these suggestions that may be especially valuable for those on a vacation are the following:

Spend much time in the open air daily.
Rest. A good time is after the midday meal.
Avoid extreme fatigue.
Drink water only of proved safety.

Avoid raw milk and uncooked sea food.

Avoid unclean hotels, public drinking cups, public towels, combs, and hairbrushes.

Masticate your food thoroughly.

Eat a variety of food.

Go to bed early.

See that your bowels move daily.

Play every day.

**204. A health vacation means success.** Using ordinary precautions to protect and to build up one's health has two distinct advantages. First, it helps one to enjoy his vacation. The person who increases speed, pressure, and fatigue during the vacation soon finds less satisfaction in the vacation. To the person who is building up mind and body the dawn of every day is greeted with enthusiasm. Secondly, the one who is recreated mentally and physically returns to work with a relish and with power to carry on his tasks successfully.

***For Informal Discussion in Class and at Home***

**1.** What should a vacation do for us?

**2.** Charles Brown and family are thinking of spending a vacation on a lake in the country. The family is composed of Mr. and Mrs. Brown; John, aged twelve; Mary, aged eight; and Alice, aged two. Make a list of the questions that should be asked about the healthfulness of the place before they finally decide to go. If they decide to go, what health preparations might they make in the way of clothing, and provision for safety and emergencies?

**3.** John Stafford and two other high-school students have been chosen to represent their school in a debate with another school at a distant point. What advice should you give them so that they may keep well on the trip?

## CHAPTER XVII

## HEALTH AND ATTRACTIVENESS

**205. Health and beauty.** It is a natural desire on the part of everybody to wish to be attractive to others. It gives a sense of power and some of the satisfaction of feeling that one is really worth while. People have various ways of being attractive to others. It may be because of keenness of intellect, a sense of humor, ability to tell a good story, the art of doing unselfish deeds, skill in musical performance, taste in dress, or any of the rare gifts of social entertainment. You may think of many other things which characterize some of the attractive personalities you happen to know. Among all these characteristics there is one that stands out prominently — good health. A person may inherit a well-formed body and attractive facial characteristics, but ill health and dissipation will cause his natural beauty to fade. A person who was not so fortunate at birth will, through right living and by acquiring good health, tend to grow more attractive. Good health naturally beautifies. Everything involving good health makes for attractiveness; but the hygiene of the skin, hands, and hair is peculiarly important, because these parts of the body play such a distinctive part in one's personal appearance.

**206. The drug-store route to a beautiful complexion and beautiful hair.** Those who do not have a healthy complexion and beautiful hair often resort to the drug store for powders, cold creams, dyes, and other cosmetics. They strive in this way to "make themselves up" so as to have a healthful appearance. This seldom, if ever, deceives anyone. Often the observer wonders what they would look like if they ap-

peared natural. The questionable kind of beauty offered by the drug store and beauty parlor is not even skin deep: it may be easily washed off. Not only do the vast majority of cosmetics contribute nothing permanent to health and beauty, but they sometimes contain poisons that are injurious to the skin, hair, and eyes. The safer way to health, beauty, and attractiveness is to take the health road, for it is always to be remembered that the manufacturers of patent medicines and the beauty-parlor experts know little about the principles of sound medicine and hygiene. A recent investigation by a special committee of the American Medical Association discloses that on the average every specialist in skin diseases has each week two or three cases of people who have been poisoned by hair dyes, face creams, powders, rouges, hair tonics, and other cosmetics. Attempting to buy beauty from a jar sometimes leads to unsightly scars and permanent disfigurement. Before considering this subject further we need to know more about the structure and function of the skin and hair.

**207. The skin.** The skin is a tight-fitting garment that covers the entire body. There are two layers: the epidermis, or cuticle, and the dermis, or true skin. The epidermis is the outer skin. The top layers of the epidermis are dead. The parts of the body that are subject to friction, like the bottom of the foot, have the thickest layers of epidermis. A corn is simply a thickened part of the epidermis. In a blister it is this part of the skin that is raised.

The deepest layer of the epidermis lies close to the dermis, from which it gets its nutrition. It is called the Malpighian layer. It has growing cells which, as they develop, push out toward the surface and die. In this layer is the pigment or dye which gives the skin its color.

The dermis is the active part of the skin. It has connective tissue, nerves, blood vessels, and some fat. Here are found

the sweat glands, with their tiny ducts leading to the surface of the skin. The chief function of the skin is that of cooling the body. Under ordinary conditions about two quarts of perspiration are excreted daily. This takes place so gradually, however, that it is largely imperceptible.

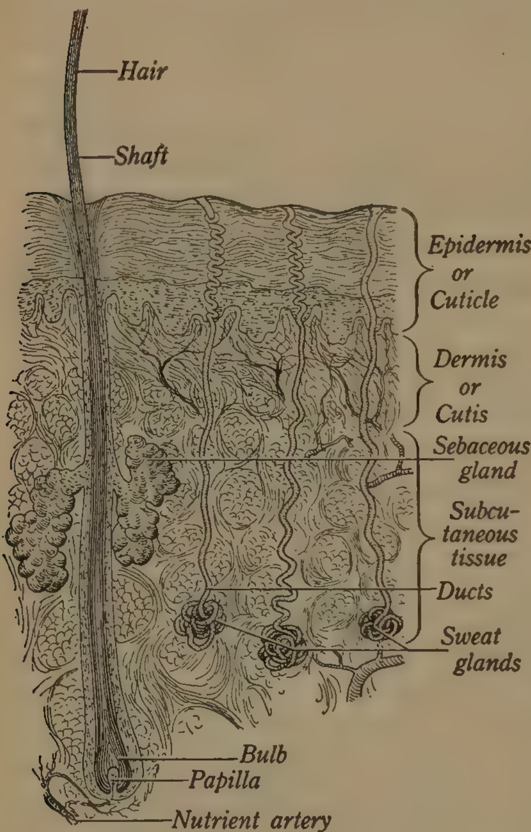


FIG. 86. Diagrammatical drawing of skin and hair

**208. The hair.** From the dermis also extend the hairs. Each hair has a bulb, or root, from which there develops a shaft which passes through the dermis. It gets its nutrition from blood vessels in the dermis near the root. The shaft has three layers of cells that are dead. In the center is a substance known as pith. Notice that the hairs are not hollow and do not need to be seared by singeing, as barbers would sometimes have us believe. Hairs are really a modified form of the epidermis. They start to grow below and are pushed upward as growth goes on at the bottom. It has been estimated by experts that the average scalp contains 120,000 hairs.

Around each hair are one or two sebaceous, or oil, glands opening up at the skin where the hair comes out. This oil, or sebum, is necessary to keep the skin flexible and the hair soft.

**209. The nails.** Like the hair the nails constitute another variety of epithelial cells. They grow from a bed of dermis beneath their roots at the lower end of the nail. The root is well embedded in a fold of the dermis. The cells in both the root and the bed of the nail are constantly developing. In this way the nail grows both in thickness and in length. In case of accident to the nail, it will restore itself if the cells at the root are not damaged.

**210. General health and the skin.** It is sometimes tacitly assumed that the skin is quite independent of the rest of the body. But students of hygiene know that whatever affects the general health of the body affects the appearance of the skin. The skin shares in the nutrition and circulation of the body as a whole. The person who is in poor health rarely has a good, clear complexion. The appearance of the skin is one of the common ways of judging the condition of a person's health. Even a slight illness may result in paleness or a pasty or sallow color of the skin. Often the person who spends so much time in fussing with the skin to make it look clean and healthful would do better to pay attention to other matters remote from the skin but directly related to it. Good food, sleep, exercise in the open air, exposure to sunshine, proper elimination, rest, recreation, and other essentials are often far better than the local treatment of the skin.

The amount of color in the skin is not always an accurate gauge of the healthfulness of the individual. There are different types of skin, varying with individuals and races. The skin varies from opaqueness to general transparency. Some people have thicker skins than others, so that the color does not show through. Blondes usually have a thinner skin than brunettes. Because of the thickness of the epidermis a certain amount of pallor does not necessarily indicate a poor circulation.

**211. Acne: pimples and blackheads on the face.** The most tragic thing about pimples (acne) on the face is that they break

out at an age when everybody is anxious to appear at his best. They are a distinct handicap in social and business contacts. No wonder that high-school students consider pimples and blackheads so seriously.

Every pimple arises from a sebaceous gland. The first stage of this disturbance is an excessive secretion on the part of these glands. The skin becomes oily. Then the overactive glands become clogged because of a retention of the skin oil. The secretion becomes hardened and coated on the surface with dust, thus forming a blackhead. As the skin is always covered with microbes, and the broken-down cells of the skin lose their power of resistance, the pimple becomes a source of infection. For this reason it is not safe to use the towel of a person who has acne. However, the person with acne is more likely to infect himself than others. Those who have pimples are apt to have the habit of fingering their eruptions and then touching the healthier regions of the skin. In this way the eruptions are spread from one place to another. Those who have facial eruptions should avoid fingering them.

The real beginning of acne is the overaction of the sebaceous glands. What causes it? One reason is youth. At the age of adolescence the equilibrium of the various glands of the body is disturbed and these are likely to be overactive. One of the optimistic thoughts about pimples is that they seldom persist after the age of thirty. Eating habits probably have something to do with pimples. Young people are prone to eat too much candy and pastry and neglect a balanced ration. It is well known that an excess of sugar in the blood lowers the resistance of the blood to infection. While food alone probably does not cause pimples, the diet may aggravate the condition.

People who lead an indoor life are more likely to have pimples than those who spend much time in the open air. Probably one reason is the beneficial local and systemic effect of sunlight. It is noticeable that a mild sunburn often has a

favorable effect on facial eruptions. Many physicians today are finding that pimples in many cases may be successfully treated with ultra-violet-ray lamps and with the X ray.

The daily washing of the face with soap and water is a matter of great importance to the person who has pimples on his face. While it is true that some thin skins are irritated by the frequent use of soap and water, these cases are very rare. Every night the face should be washed thoroughly with plenty of soap and warm water. Then the soap should be rinsed off. A final cold rinse is desirable. The real purpose of soap is to cleanse the skin.

In those cases where acne does not yield readily to the hygienic treatment referred to, a specialist on the skin (dermatologist) should be consulted.

**212. General suggestions on the care of the skin.** The first essential in securing or maintaining a good complexion is to keep in good general health. The second essential is cleanliness. For this purpose nothing is so good as water. It has been said that certain stage celebrities noted for their beauty never used water on their faces. Cold cream alone was used. This is doubted. If it is true, these people always had dirty faces. Sometimes when the face is soiled, cold cream may be used preliminary to cleansing with water or as a substitute when the skin is irritated or dry. Some of the creams advertised for their miraculous powers contain lead, from which poisoning may arise. When creams are used they should be of well-known composition. No magic should be expected.

Facial powder may be talcum powder alone, rice powder alone, or either of them may be mixed with other substances. These substances may or may not be harmful. If cosmetics do not contain harmful chemicals they apparently do little or no damage if thoroughly removed at night. So far as the pores of the skin are concerned, talcum powder may be regarded as white dirt.

**213. The care of the hands.** Clean hands are one of the marks of refinement. Grimy hands and unkempt finger nails are the stamp of carelessness and a serious handicap in society and business. A number of years ago there was a vacancy in a department of a college. There were many applicants. Among them was a man who had degrees from several universities and excellent recommendations as to his character. As a scholar and a man he stood above all the other applicants, but he did not get the position. In his interview with the president he wore a collar that had a suspicion of chocolate color, and his hands looked grimy. The finger nails were long, had jagged edges, and showed black underneath. This man might have been successful later on, but his unkempt hands were certainly a handicap to success. They would also be a handicap in business.

Not only in an æsthetic sense but also from the point of view of health the care of the hands is important. They come in contact with so many things in the course of the day and are so liable to collect disease-producing bacteria that the habit of keeping the hands clean is one of the essentials of healthy living.

Religious rituals going back through the centuries emphasize clean hands. Among the ancient Hindus specific directions were given for washing the hands. The right hand was to be washed ten times and the left seven times. Even if the Hindus had known about germs they could not have given better advice. In the Old Testament clean hands become symbolic of spiritual and moral excellence. "Who shall ascend into the hill of the Lord? or who shall stand in His holy place? He that hath clean hands, and a pure heart."

The hands are really very tough and may stand a good deal of scrubbing. A scrubbing brush, warm water, and soap are essential. All toilet articles should be individual. The brush should not be too stiff or too soft and should be sunned

FIG. 87. Nature in her various moods is worth knowing and cultivating

frequently in the open air. The hands will not chap if the soap is well rinsed off and the skin is entirely dry. The hands should always be washed after going to the toilet and before eating.

The nails require careful attention, since they have rather a delicate connection with the skin. The skin has a tendency to adhere to the nail, to become stretched and finally torn. Hangnails may occur unless the skin is kept pushed back from the nail. This may be done easily when the skin is soft after a bath. Cold cream may be applied at night to keep the skin soft if it tends to become too dry. If the cuticle has grown too much, a blunt orange stick may be used to push it back. When hangnails form they should not be pulled away, since this often injures the skin and invites infection. It is better to cut away the cuticle. Acids advertised for the removal of the cuticle should not be used. They dry the skin and lead to hangnails.

It is better to file nails than to cut them. The natural outline is preferable to a long, pointed one, since the point may be broken. There should be a narrow margin of white beyond the red bed of the nail. It is a disgusting habit to allow dirt to collect under the nails. Dirt should be removed daily with a dull orange stick or the blunt end of a file. According to the best standards of etiquette one's toilet should be taken care of in one's room. The practice of cleaning one's nails on the street or on a car or in public places is not approved by refined people.

**214. The care of the hair.** An abundance of healthy glossy hair is in part a matter of heredity and in part a matter of care. Baldness and premature grayness seem to run in certain families. The endocrine glands are now known to influence the amount and quality of the hair.

The falling out of the hair and subsequent baldness is one of the serious problems connected with the hair. Some of the

hair is falling out all the time and being renewed. It is only when there is not sufficient renewal that there may be cause for alarm. Baldness is common in men and rare in women. This may be due to heredity in men, although we have no positive proof that it is not always acquired. Baldness may or may not be accompanied by dandruff. When present the latter is considered the cause. Dandruff is composed of scurf, with an excess of sebum, the oil secreted by the sebaceous glands. This forms in dry scales that may be rubbed or brushed from the scalp, or it may be greasy and adhere closely. When it appears, everything should be done to minimize it by keeping the scalp as clean as possible. Dandruff may be due to deficient circulation. The tight-fitting and badly ventilated hats worn by men probably have something to do with the baldness found among them. There is no evidence that brain activity has anything to do with baldness.

There is a common superstition that the cutting or shaving of the hair promotes its growth. While this may slightly change the character of the hair, there is no evidence that baldness may be prevented or cured in this way.

Superfluous hairs on the face of women are sometimes the cause of much distress. The best method for their removal is to use the electric needle. This is plunged to the root of each hair separately. This treatment should be in the hands of an expert dermatologist. Beauty parlors should be avoided, especially for this form of treatment.

The color of the hair, especially the change to grayness, is another cause of distress to many. In spite of the many advertisements on restoring the hair to its natural color, no such remedy exists. Only by dyes may the color of the hair be restored or its color changed. But, as the hair grows, the dye must be applied anew. This makes the dyeing a frequent task. There are vegetable dyes that are not injurious, but most of the patent remedies contain lead or other injurious

substances. General poisoning sometimes results from hair-dyeing. The irritation from the scalp may spread to the face. It has been well said that the only thing to do with gray hair is to admire it. Bleaching the hair with peroxide of hydrogen is open to as serious objections as dyeing.

The advertisers of hair tonics make extravagant claims which cannot be substantiated. Such tonics should not be used without medical advice.

If there is no disease of the scalp, the hair may ordinarily be kept in a satisfactory condition by suitable care. This care will vary somewhat with different individuals. In general, the hair if carefully washed may be washed as often as one chooses. Some people wash the hair every day with no bad result. The important thing is to leave no soap in the hair and to dry it carefully. If it is washed often, soap should not be used more than once or twice a month. Dirty hair is seldom as attractive as clean hair.

In shampooing, the washing of the scalp is more important than the washing of the hair. Any good soap that is not strongly alkaline is satisfactory. The water should be soft. After the head has been thoroughly washed, the water should be changed, the hair rinsed, then washed a second time with soap, and then rinsed free from all soap. The bath spray is excellent for rinsing. The hair should be thoroughly dried. Dry towels and vigorous rubbing are effective ways of drying the hair and scalp. People who naturally have a dry scalp may find it advisable to apply a little oil to the scalp with the tip of the fingers. A small amount of olive oil or white petrolatum will suffice. A deficiency in the amount of natural oil in the scalp may be relieved to some extent by massaging the scalp daily.

In the daily care of the hair there should be a thorough brushing to remove dust, dirt, and dandruff and to distribute the natural oil. One should use his individual brush and

comb. A stiff brush is better than a soft one, although it should not be so stiff as to injure the scalp and possibly cause infection. The circulation of the scalp is greatly stimulated by vigorous brushing. To keep a brush clean, wash it in a solution of ammonia and expose it to the sun. Brushing the hair does not cause it to fall out. It merely removes those hairs that are ready to fall out and gives place to the growth of new ones. Combs should not be so fine as to tear tangles, nor should the teeth be sharp or rough so as to injure the scalp. Wetting the hair is not objectionable if it is not too wet to dry quickly.

As in the case of the skin the health of the hair is promoted by the general health.

**215. "Some Bald Facts."** This is the title of a very interesting article that appeared in the October, 1927, number of *Hygeia*. The author, Dr. Arthur J. Cramp, is a director of the bureau of investigation of the American Medical Association. It is his business to investigate the false and extravagant claims of all sorts of cures. He has exposed the claims of many patent medicines. In this story Dr. Cramp refers to a "Professor S" who published advertisements in many newspapers and magazines in which he claimed to be "America's foremost specialist on hair and scalp diseases." He claimed to give individual advice to his correspondents if they would submit to him samples of their combings for microscopic examination. Professor S claimed that he could stop the falling out of hair and positively restore the hair and scalp to a normal condition. Samples of fox hair from a woman's fur coat were sent in, and the reply from Professor S was that the microscopic examination showed the roots of the hair to be in a seriously undernourished condition, but that it was not too late for treatment, and that he could prescribe successful treatment. From another address a letter inclosing hairs from a coat made of the fur from a

Siberian dog brought exactly the same letter. It was evident that the "professor" could not tell the difference between human hair and that of a fox or dog. From still another address three healthy hairs from a woman with a perfect head of hair were sent in with a request for analysis and brought back the same identical letter as before. The professor found it seriously undernourished. As a further test twine filaments were colored brown and black to resemble hair and were sent from two separate addresses; they brought back the same form letter that the analysis showed undernourishment of the hair.

It is evident that this is an attempt to defraud the public. Professor S is not a professor or a physician, and is unheard of among scientific men. Anybody with even a superficial knowledge of the hair could tell the difference between hair and twine. Probably because of the representations of Dr. Cramp, Professor S is being prosecuted by the post office, but there are others to take his place. Such a story reveals the uselessness and even the danger of self-medication and the desirability of consulting reputable physicians.

**216. Bathing.** There are three different kinds of baths: the cleansing bath, the stimulating bath, and the sedative bath.

The collection of dirt, scales from the skin, perspiration, and oil on the skin makes a cleansing bath necessary. The regular tub bath with warm water and soap is most satisfactory for this purpose. The action of the soap is to dissolve the oil on the body and so liberate the dirt. This removes the layer of oil covering the body and clogging the outlets of the oil glands. The number of baths for cleanliness will depend on the kind of work or recreation, and the time of the year, but under the general conditions of school life it is safe to say that more than one a week is necessary.

For stimulating effects the cold bath is admirable. Therefore it should never be taken just before retiring, but the first thing in the morning. Since it is not expected to cleanse, the

use of soap is unnecessary. It should not last longer than a few seconds and ought to be followed by a brisk rub with a rough towel. The first effect of a cold bath is to constrict the outer blood vessels and make the muscles tense. The sensation of coldness passes after one gets out of the water and takes a brisk rub. Those who do not react in this way are probably not in good physical condition for the cold bath or are not taking it properly. This reaction may be cultivated by people in good health by briskly rubbing the body with a dry towel each morning for a few days or weeks. Then a tepid sponge bath may be followed by a rub. Gradually each morning the water should have a decreasing temperature until the cold bath is enjoyable. The cold bath stimulates the circulation, makes one thoroughly awake, and arouses a feeling of well-being. It tends to increase one's resistance against colds.

The moderately hot bath is sedative. It is especially valuable for those who suffer from insomnia, or sleeplessness. People who have difficulty in going to sleep for two or three hours after retiring are often able to fall asleep quickly and sleep soundly through the night after they have had a moderately hot bath.

### *For Informal Discussion in Class and at Home*

1. Write a story or a play in which attractiveness is won through becoming healthy.

2. Why is the health route preferable to the drug-store route to attractiveness?

3. Discuss the care of the skin.

4. Discuss the care of the hair.

5. Why is the care of the hands important? Discuss in detail.

6. Look over copies of the health magazine *Hygeia* for articles which reveal deceptions practiced on the public through cosmetics and hair dyes. Report on these to the class.

# CHAPTER XVIII

## DRESS FOR HEALTH, COMFORT, AND BEAUTY

**217. Change in styles.** Those who have traveled observe a wide difference in the habits of peoples regarding dress. Motion pictures bring to us a great variety of costumes, including those of people inhabiting the arctic regions, with their furs, and those living in the tropics, who wear little or nothing. It is only necessary to refer to old photographs and prints of less than a generation ago to bring forth a smile and the comment "What funny styles in clothes people wore in those days."

Clothes have been worn by people for three purposes: for decoration, decency, and health. The earliest use of clothing by man was for decoration. Decoration preceded utility in the history of clothes. This desire for decoration seems to be irresistible. This complication persists even at this period of civilization. There are many practices which subordinate health to decoration or, as it may be termed, style.

**218. The protective use of clothes.** The function of this chapter is to discuss the hygienic or protective use of clothes. In the temperate and frigid zones the main use of clothing is to aid the body in maintaining its constant temperature, which is 98.6° Fahrenheit. In the tropics, where there is much strong sunlight, the white man protects himself from the burning rays of the sun with an umbrella, a pith helmet, and white cotton and pongee clothing. Clothes are used as a protection from dirt. Clothes keep us clean. Hence the necessity for frequent changes of underwear and frequent brushing of outer garments.

Shoes may also be regarded as a part of our clothing. They serve the additional purpose of protection from mechanical injury.

Since one of the chief uses of clothes is to help the body to maintain a temperature which is healthful and comfortable, let us notice the way in which the body performs this task. An ingenious mechanism maintains a constant body temperature.


Ewing Galloway

FIG. 88. Suitable clothing for the tropics

**219. Bodily heat.** In order that the bodily functions may be properly performed, it is necessary for the body to maintain a certain temperature. Just as plants are killed by the frost or withered by the heat of the sun, so our tissues die if the bodily temperature falls below or rises above a certain limit. Our bodies, however, differ from plants, in that they govern and regulate their own temperature and possess the power of adapting themselves to extremes of external heat and cold without suffering any vital injury. Although the

external temperature of the body may vary enormously without hurting us, the bodily temperature must be right for health. The standard, or normal, temperature is 98.6° F.

**220. Production of heat.** Heat is produced in the body by the chemical changes that are constantly going on. Whenever metabolic changes are taking place, then heat is set free.

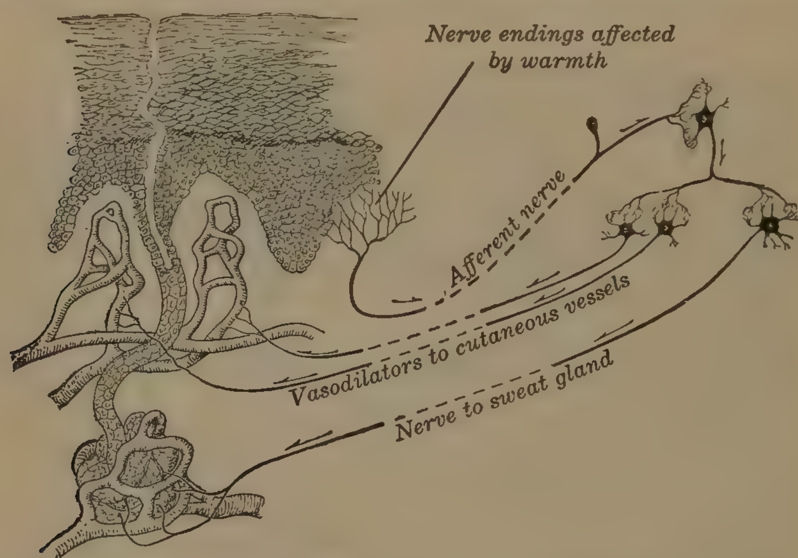



FIG. 89. Diagram of the skin's response to a sensation of warmth

Scattered throughout the skin are nerve endings which aid in regulating bodily temperature. The stimulus of warmth in the nerve endings causes the vasodilators to dilate blood vessels in the skin and constrict those in the internal organs. Warmth also causes the sweat glands to secrete. Explain how these functions cool the body

The muscles and the liver are the main sources of heat, since these parts of the body are the seats of very active metabolism.

**221. Distribution of heat.** The blood, as we know, permeates all the tissues. Whenever exercise takes place and heat is generated, the blood circulating in the tissues is warmed. On the other hand, when the blood vessels are exposed to evaporation, as in the lungs, or to radiation in the skin, the temperature of the blood is lowered. The gain and loss of heat balance each other with great nicety, and the blood,

circulating rapidly first through warmer and then through cooler tubes, is kept at a uniform temperature.

**222. Regulation of heat.** Normally the production of heat is balanced by loss of heat, and the chief regulator of this gain and loss is the skin. This is seen in the case of muscular exercise. Every muscular contraction gives rise to heat, and yet during severe muscular exercise the temperature of the body does not rise appreciably. This is accounted for by the fact that when muscular exercise causes the blood to circulate more rapidly than usual the blood vessels in the skin dilate, and at the same time the sweat glands are excited to more abundant secretion, reduction of heat from evaporation resulting. Increased respiration also throws off heat.

In exposure to variations of extreme temperature the blood is also the chief agent in regulating the heat of the body. When the external temperature is high, the cutaneous, or superficial, blood vessels dilate; when the external temperature is low, the cutaneous blood vessels contract and the skin remains dry.

**223. Loss of heat.** It has been discovered that in every hundred parts of heat formed in the body, approximately 80 per cent is lost in conduction and radiation from the skin, while the remainder, or 20 per cent, is utilized partly in warming the food and water ingested and the air inspired, partly in the evaporation of water from the air passages and from the skin, partly in the liberation of carbon dioxide from the lungs, and partly in the urine and feces.

**224. Clothing and warmth.** To dress properly for health is to help the body to keep its normal temperature. Clothes keep us warm, but they do not of themselves produce heat. They keep us warm by preventing the outflow of heat from the body. Someone has said that there is no such thing as cold, but there is the "relative absence of heat." This being so, then our problem is to keep in the heat by wearing clothes

which are bad conductors of heat, and so retain the normal body warmth. Since clothes constantly tend to retard the flow of heat from the body, and since the temperature must be kept constant, plainly there is a relation between the amount of clothing one should wear and the amount of oxidation that

FIG. 90. The Eskimos need warm clothing to protect them from the cold

occurs in the body. Those who produce least heat should wear warmer clothing. Those who are active and energetic require less clothing because they are producing more heat.

The energy and heat produced in the body are derived from the food we eat. The better the body is protected from the dissipation of heat, the less food will be required to produce heat. Conversely, the greater the radiation of heat from the body, the greater will be the need for heat-producing food.

Proper clothing has a direct bearing on the economy of food. This is an important item in large families and among the poor.

Those who have a tendency to disease of the kidneys should wear warm clothing. The warm clothing encourages the action of the skin, which supplements the excretions of the kidneys and so lightens the work of that organ.

**225. Comfortable clothing.** Clothing should not restrict the movements of the body nor cause constriction or pressure. A tight hat, tight collar, or tight garters affect the circulation of blood in the veins. The prevalence of baldness among men is ascribed to the congestion that is caused by wearing tight hats. The soft hat is better adapted to conform to the head than is the hard, rigid derby. Likewise the wearing of soft collars, replacing the high, starched collar, is a distinct improvement. The use of tight garters must be condemned, because the flow of blood in the extremities is greatly retarded. Many people suffer from cold feet and hands because they ignore the rule that clothing must be loose. If the gloves or shoes be tight, normal circulation is arrested, and this lowers the temperature of the hands or feet. Gloves and shoes should be sufficiently large to allow the blood to circulate freely so that warmth may be maintained.

We all know the difference between still air and air in motion. Dry, still air is a poor conductor of heat. It is not only the clothes that keep us warm, but we also depend upon the air contained within the meshes of clothing to retain the heat. A given amount of material of any texture is warmer as a loose garment than as a tight one, because of the added amount of still air.

**226. Loss of heat through the skin.** Hough and Sedgwick[1] have stated clearly the processes by which heat is taken from the skin. These processes are (1) heat transfer to colder objects and (2) the evaporation of perspiration.

[1] The Human Mechanism, pp. 423–424. Ginn and Company.

1. Any fabric whose texture permits the air warmed by contact with the skin to be replaced readily by colder air from without will obviously favor the cooling of the skin; and conversely, any garment which lessens or altogether prevents these currents of air through it is to that extent a warm garment. . . .

Even apart from the passage of air through the clothing, heat may, of course, be transferred from the skin to the outer air, and some fabrics transfer heat more readily than others. Other things being equal, *the rate at which clothing transfers heat depends on the amount of air within its meshes. . . .*

2. So long as the meshes of a fabric contain air, heat is conducted but slowly from the skin. When, however, this air is partially or entirely replaced by water, the fabric transfers heat from the skin much more rapidly, and if the surrounding atmosphere is distinctly colder than the body, the skin becomes chilled and internal organs congested; hence the danger of wet clothing. . . . We have learned that perspiration is useful to the body *only as it evaporates.* Consequently the clothing should be such as will *permit the perspiration to evaporate almost as fast as it is secreted.*

**227. Value of different substances for clothing.** The substances from which clothing is usually manufactured are wool, silk, cotton, linen, leather, and fur. The fibers are woven either singly or in various combinations. Paper is sometimes used for making vests; and felt, which is made by interlacing and matting, is extensively used to make hats, slippers, and linings for boots.

Wool is the most valuable of clothing material for those living and working in a cold or variable climate. For those who are obliged to lead sedentary lives by reason of chronic illness or disability, with whom the body vitality is low, woolen underwear is most useful to maintain normal temperature. Comparing wool with cotton or linen, fiber for fiber, there is comparatively no difference in their conductivity. The difference occurs in the process of weaving. The firmness and elasticity of the wool fibers keep them separate, providing

greater air spaces, which, as has already been stated, are especially good nonconductors of heat. Wool absorbs moisture and perspiration more slowly than cotton or linen and, when thoroughly wet, dries more slowly. As ordinarily woven, many persons cannot tolerate wool next to the skin because of its irritation to the skin. Silk and wool are sometimes woven so that we have half wool and half silk, and this makes a desirable combination for some purposes. Cotton and wool mixtures also are woven.

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FIG. 91. An aviator dressed for flight

As the temperature at 35,000 feet altitude is about 58° F. below zero, it is necessary that he wear extraordinarily heavy clothes. Liquid oxygen is carried, since the outside air would be too rarefied for him to breathe at such a great height

Of all the materials for clothing, cotton is probably the most generally used. Cotton, as it is usually woven, contains few air spaces, and this, together with smooth ironing, makes it a good conductor of heat. If it is smoothly woven and of a light color, it makes extremely cool garments for warm seasons and climates. If it is woven so as to confine much air, this will add greatly to its warming qualities.

When cotton is worn during exercise, it should be removed immediately at the close of activity or more clothing added so as to prevent too rapid evaporation and cooling.

Silk, aside from its high cost, is an excellent fabric for the manufacture of undergarments, shirts, and stockings. It is a splendid nonconductor of heat and of advantage to those who cannot wear wool next to the skin.

Linen is similar to cotton in its properties. It is more durable and desirable for use as clothing in hot climates. It is easily cleaned and renovated and holds its shape.

Furs are used in all climates where extreme protection against wind and cold is necessary. The skin is impervious to wind, and the hair of the pelt enmeshes a great quantity of air, so that there is double protection.

Leather is extensively used for the manufacture of shoes and jackets. It is practically impervious to moisture if it is given a proper oil treatment. It is durable and pliable — prime requisites for foot coverings.

Rubber is extensively used in making raincoats and foot rubbers, principally for protection from rain and moisture from the air and ground. Raincoats and rubbers should not be worn indoors at the usual house temperature.

The value of any material for clothing depends upon the ease with which heat passes to and from the skin, the amount of air meshes it contains, the evaporation of moisture, and the impermeability to wind.

**228. Outer garments and underwear.** The kind of underwear worn, as well as outer garments, should be decided by the exposure to temperature when the body is at rest.

Our houses, schools, and offices are maintained in winter at a temperature of from 65° to 68° F. sometimes even warmer. Undergarments should be worn to meet this condition by those who are employed indoors. Protection from cold, rain, and wind should take place through the wearing of additional outer garments.

Those who are employed outdoors in winter weather should wear wool or combinations of wool next to the skin, depending

upon the amount of exercise or work which is done. It must be remembered that exercise generates heat, which assists in maintaining the body temperature.

In warmer climates white cotton or linen serves to protect the body from the sun's rays and to promote evaporation and drying, which more easily takes place through these fabrics.

Precautions should always be taken, by the use of additional clothing or wraps, to avoid sudden changes of temperature through rapid evaporation after exercise or after leaving a warm atmosphere, so as to prevent the chilling of the skin and the resulting congestion of internal organs.

*For Informal Discussion in Class and at Home*

1. When you purchase a suit of clothes do you pay for style or for serviceability? What do you think is our habit in this respect? What should it be?

2. Do all people require the same amount of protective covering? Is it necessary to study our individual needs? What may determine our needs? What standards should we follow in our clothing for winter? for summer? for indoors? for outdoors?

3. What are the ill effects of tight collars or garters?

4. What precautions should we take after exercise or vigorous work?

# CHAPTER XIX

## ALCOHOL, TOBACCO, AND DRUG HABITS AS LIABILITIES

**229. How habits and customs change.** One of the most interesting things about life is the fact that it is constantly changing. This is forcefully impressed upon the visitor who wanders through the National Museum at Washington, D.C., for the first time. In one part of the museum, for example, the visitor sees the likenesses of many of the presidents' wives, each one dressed in the costume of her particular day. In a few minutes, as he strolls along, it is possible to get a bird's-eye view of women's dress over a period of more than a century. The observer can hardly do this without some expression of amusement. It is quite impossible not to smile at the hoop skirts and other peculiarities of a bygone day. How out of place any person would feel today in colonial dress! The dress of the colonial gentleman was beautiful and dignified in many ways; but if a man today were to wear to business a powdered wig, a long-tailed coat, knee breeches, long stockings, and buckles on his shoes, he would be called a freak. We say that those things are behind the times, except for theatrical purposes, just as much as traveling by oxcart and stagecoach. Steam and electricity have revolutionized the world. What is true of dress and transportation is true of almost everything that pertains to civilization. Today is different from yesterday, and tomorrow will be different also.

Among the remarkable changes that have taken place is one relating to a custom man has had for a long time, that of poisoning himself with alcoholic liquors.

**230. Drinking customs changed.** A hundred years ago the drinking of wine, brandy, and other alcoholic liquors was common. No meal was complete without liquor. The grocer carried it in stock as he carries sugar and salt today. Ministers and churches used it on festive and solemn occasions. At all

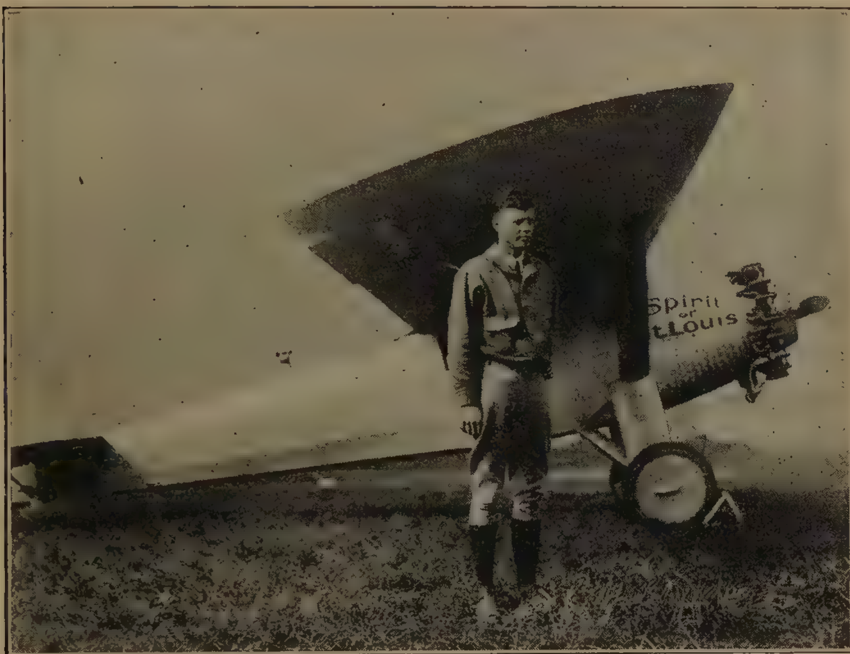





FIG. 92. Colonel Charles Lindbergh

Courage, endurance, and self-control have helped to make him the world's most famous aviator

social gatherings it was in general use. In those days it was not regarded with extreme disfavor if some men at a party became intoxicated. Public opinion was entirely favorable to the use of alcoholic drinks.

But gradually men began to think of alcohol as an enemy of mankind rather than as a friend. Changes in opinion, custom, and habit are often the result of learning that certain acts and conditions bring unpleasant consequences. This was

true of drinking alcoholic liquor. Some people began to notice the evil results of this habit in their own lives and in the lives of others. This happened even before science declared that alcohol was a poison. Some of the people who saw the harm resulting from the drinking of alcoholic liquor organized societies to combat its use. Later many people began to feel that it was wrong to permit the sale of liquor that caused so much harm, and the question of licensing such sale became a political issue. Gradually many towns, cities, counties, and states passed laws forbidding its sale. Finally enough people became opposed to the liquor traffic to include the Eighteenth Amendment in the Constitution, making illegal the manufacture or sale of alcoholic liquors in the United States. The battle against alcohol is not confined to America: it is worldwide. Practically every civilized nation in the world is trying to rid itself of the evils of drink.

**231. Various alcoholic liquors.** Alcohol is produced by the fermentation of sugar. A similar process takes place when any food containing sugar begins to spoil. For example, the housewife finds occasionally that one of her cans of fruit has started to sour, to "work." This was what happened: the fruit was not sealed air-tight. Floating round in the air are little microscopic plants. Some are tiny mold germs; some are yeast cells. They found their way into the canned fruit and changed the sugar. The mold germs are usually the cause of the souring of stewed or canned fruit. They change the sugar in such a way that much acid is produced. But when fruit juices are pressed out the conditions are more favorable for the yeast cells. They change the sugar into carbon dioxide, which rises to the top in bubbles and escapes, and also into alcohol, which remains in the liquid.

Fruit juices may be prevented from fermenting by heating to the boiling point and sealing air-tight while hot. The heating kills the yeast germs.

All fruits and grains that ferment form alcohol. The process of fermentation will continue until the sugar is entirely used up or until the liquid contains about 15 per cent of alcohol. At that point the percentage of alcohol is so great that the yeast cells are deadened or killed by the alcohol. Wine and cider are alcoholic drinks produced by the simple fermentation of fruit juice.

The so-called malt liquors are made from sprouted grains. When the grain is sprouted, a large amount of the starch is changed into sugar. The watery extract of this sprouted grain is known as "wort." After it is boiled with hops, yeast is added, which acts upon the sugar and causes fermentation. After this liquid is fermented, it is known as beer, ale, or porter, depending upon the conditions under which the fermentation took place, the character of the sprouted grain or malt, and the kind of yeast used.

The alcoholic beverages containing the largest amount of alcohol are whisky, brandy, rum, and gin. The process of manufacturing these is essentially the same. First there is a fermentation in some sugar-containing liquid. Alcohol and some other volatile products are distilled from the products of this fermentation. In the process of distillation the alcoholic liquid is heated and the vapor is condensed and cooled. The resulting liquid contains a large percentage of alcohol.

**232. Alcohol a drug rather than a food.** Those who favor the drinking of alcoholic liquor offer many reasons for their attitude. Many of these had their origin in the past before science had given its evidence. Practically all the defense of the use of alcohol crumbles before the light of modern science and clear thinking.

One of the most persistent of the claims for alcohol is the notion that it is a food. Whether it is to be regarded as a food or not depends on our conception of the meaning of food. Good food like milk has one or both of the following values: it supplies the body with heat and energy and furnishes

material for growth and repair. It does these things without doing the body injury.

Alcohol has sometimes been regarded as a food because it can be oxidized or burned in the body to liberate energy. Although this is true, it seems to be true only when it is taken in small quantities. There seems to be a good deal of evidence to show that the oxidation of alcohol which takes place largely in the liver is a protective oxidation; that is, it is oxidized there not to produce energy but to destroy the alcohol, the body thus being protected from its influence. The energy which is liberated does not seem to increase muscular power and the capacity for brain work. Unlike milk, alcohol cannot be utilized for growth and repair. There is abundant evidence to show that the drinking of alcoholic liquors throws upon the liver and kidneys abnormal strain, making them more susceptible to disease. The mere fact that alcohol can be oxidized does not entitle it to be called a food. Ether, chloroform, and iodine can also be oxidized, but nobody would consider using any of these as foods. They are all classed as drugs.

Under certain conditions alcohol is sometimes prescribed by physicians, but as a drug, and as such it is being used less and less by medical men throughout the world, who are aware of its dangerous habit-forming tendency. Even if alcohol were to be regarded as a food, its expense and the evil effects resulting from its use would make it impossible to classify it with bread, milk, vegetables, and other desirable health foods.

**233. Alcohol a narcotic.** Long ago it was thought that alcohol was a stimulant: that it excited the nerves and muscles to action. Later scientific investigations showed that it is a narcotic. Instead of stimulating the nerve cells, it tends to deaden or paralyze them. Its action is similar to that of ether and chloroform. Before the discovery of anæsthetics it was not uncommon for physicians to give their patients alcoholic liquor to ease their suffering.

**234. Alcohol and self-control.** Since alcohol often makes a man seem more talkative and lively, one might question its narcotic effect. This apparent liveliness is due to the deadening of the nerve centers of control. As we all realize, we have a tendency to say and do many things that we check because we foresee undesirable or unpleasant results. The higher nerve centers in the cerebrum act as brakes and thus enable us to control ourselves. They function in much the same way that brakes do on an automobile. When the brakes refuse to act, the automobile speeds down hill. It exhibits more activity but less control. Consequently the drinker in the first stages of intoxication may show great gayety, talkativeness, or extravagance of speech. As the nerve centers become dulled, his power of self-control is impaired, he loses self-respect, and exhibits a general lack of responsibility. If the drinking continues, there is a clumsiness or inaccuracy of the muscles, a slurring of the speech, and a don't-care feeling sometimes leading to recklessness. If the narcotizing of the nervous system continues, there will be unsteadiness of the muscles, and finally unconsciousness will result.

**235. Alcohol and muscular work.** Many experiments with individuals and also with large bodies of men show that even small quantities of alcohol decrease the amount of work accomplished and increase fatigue. Dr. Schnyder of Bern tested muscle work with an ergograph in his laboratory. The ergograph is a piece of apparatus operated by the muscles of the fingers. An exact record is kept by an ingenious device. Dr. Schnyder found that when he took with his dinner an amount of alcohol equal to that in two glasses of beer he did 8.6 per cent less work than on corresponding days when he took no alcohol.

Dr. Durig carried out some interesting experiments in mountain-climbing. The mountain was Mt. Bilkencrat, which is eight thousand feet high. He made a very careful study to

determine how much energy he expended and how much work measured in foot-pounds he accomplished and the time required to do it. On some of the days the ascent was made with the drinking of alcohol equal to the amount in from two to three glasses of beer. On other days of climbing no alcohol was taken. Dr. Durig had the impression that he worked more easily on the alcohol days; but, on the contrary, he found that although he spent 15 per cent more energy on the alcohol days he did 16.4 per cent less work per second, so that it took him longer to climb the mountain. Although he worked harder he accomplished less. Many persons imagine that they are working better and with less fatigue after taking alcohol; but this idea is due to the blurring of judgment by alcohol. Fatigue is not removed by the alcohol, but for a time the *feeling* of fatigue is dulled.

**236. Alcohol and mental efficiency.** Another tradition which has no scientific justification is the belief that drinking alcoholic liquors makes the mind quicker and more efficient. Since alcohol is a narcotic and not a stimulant, we might assume at once that this statement is untrue. Experiments bear this out.

One of the first series of scientifically conducted tests of the effect of alcohol on mental faculties was carried out in the University of Heidelberg, Germany, by a world-noted specialist in mental diseases, Dr. Emil Kraepelin. He trained a number of his pupils, young physicians, in precise methods of making the tests so as to secure the greatest accuracy. The kinds of mental work tested included adding figures, memorizing, reading, and a very delicate test of the qualities of the mind called the association of ideas.

The chart here shown illustrates how one of these young physicians reacted to one set of memory tests. They were continued for 27 days. The lighter lines show how the ability to memorize increased by practice, when no alcohol was taken, un-

til the seventh day, with a slight diminution on the sixth caused by loss of sleep. Then after a dose of alcohol equivalent to that in from one and one-half, to three pints of 5 per cent beer the work fell off until all the gain from practice was lost. When the alcohol was stopped, a rapid improvement set in. Each day's work mounted again above that of the preceding. By connecting the top of the highest columns representing the work of the days without alcohol the approximate loss caused by

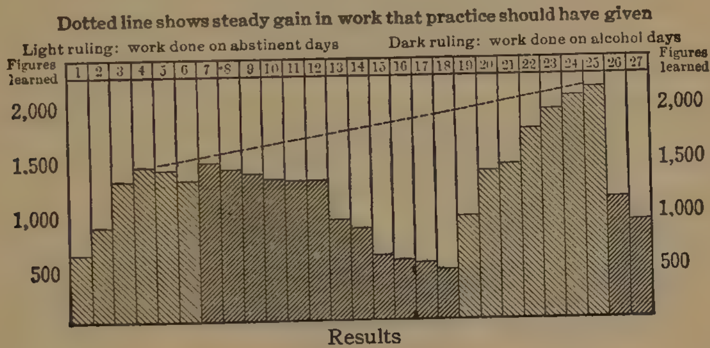



FIG. 93. Daily drinking greatly reduced ability to memorize. The effect of alcohol increased from day to day

the alcohol can be seen. Without it the improvement, with probably slight variations from day to day, would have progressed steadily until the limit of efficiency was reached. Instead, the ability to memorize fell off when the alcohol was taken.

The doses of alcohol used in the experiments in Professor Kraepelin's laboratory were such as were then ordinarily considered moderate in Germany. But in America these amounts were thought to be rather large, and similar tests, with smaller doses and improved methods, were carried out in American laboratories. Two series of tests that included various kinds of mental work were made with beer, or an alcohol solution similar to beer, in which there was only 2.75 per cent of alcohol. Enough of this was taken in some of the experiments to amount to 27.5 grams, or two tablespoonfuls, of alcohol. In other

experiments the dose was larger, amounting to about two and one-third tablespoonfuls of alcohol.

A report of the results obtained on six subjects by one of the experimenters, Dr. H. L. Hollingworth, said:

> In all of the mental and motor tests here used the effect of alcohol is to reduce the score. The hand is made less steady, motor coördination less accurate and rapid, rate of tapping is reduced, the processes of color naming, naming of opposites, and adding are slowed down and the rate of substitution learning is less rapid.

The effects even of the smaller dose lasted to the end of the day in some of the tests; in others it had disappeared at the end of about three hours.

Another experimenter, Dr. Walter R. Miles, estimated the average loss of efficiency in his most purely mental test on eight young men at from 4 to 5 per cent. He said of his results that the whole picture was one of decreased efficiency.

Many experiments like this show that (1) even moderate drinking considerably reduces the amount of mental work that one can do; (2) its effects are cumulative, the losses caused by it increasing as time goes on; (3) the habitual and moderate drinker can never be expected to work up to the limits of the efficiency which he would attain if he were entirely abstinent.

Experiments in adding, typesetting, and other activities tell the same story. The best work and alcohol do not go together.

**237. Drink and the death rate.** If alcohol is a poison and has the unfortunate effects upon human life recorded in the previous pages, we might expect that it would tend to lessen length of life. Advocates of drink have often taken delight in pointing to people who have been hard drinkers and yet have lived to be aged. Although these cases exist, it would be dangerous to reason from such evidence. Such persons

may have been born with unusually good bodies and may have had other habits that were so conducive to health that they managed to a very large extent to counteract the influence of alcohol.

The real truth of the matter must be found in an investigation covering the lives of a large number of people. Such an

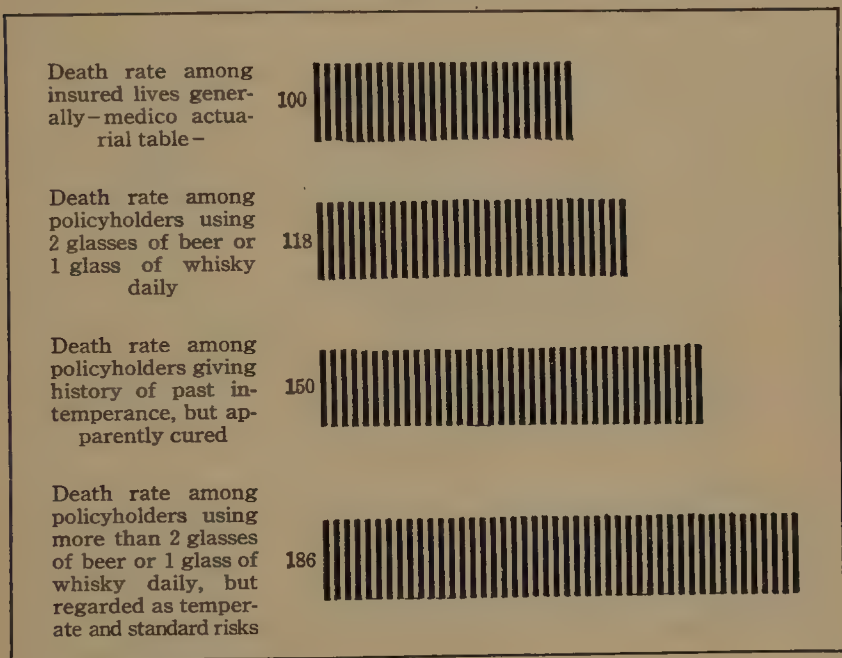



FIG. 94. Comparative mortality among users of alcohol, as recorded by forty-three life-insurance companies from 1885 to 1908

investigation was conducted by forty-three of the leading life-insurance companies of the United States and Canada. The records of two million were considered. The investigation covered the period between the years 1885 and 1908. In this study all individuals were excluded from consideration except those who were in sound average condition when insured. The story is told in graphic form in Fig. 94. It will be noted that steady drinkers who at the time of applying were accus-

tomed to drink daily more than two glasses of beer or a glass of whisky, or the alcoholic equivalent of these, had a mortality rate 86 per cent in excess of the average.

Little wonder that Mr. Arthur Hunter, the chairman of the committee who made the investigation, said, "Total abstinence from alcohol is of value to humanity; it is certain that abstainers live longer than persons who drink alcoholic drinks."

**238. Use of alcohol and resistance to disease.** Good health depends in large part on our ability to resist disease. The germs of disease are all about us. Whether they are to gain a foothold or not depends on the resistance the body makes. Many experiments show that the use of alcohol lessens this resistance. Dr. Osler and Dr. McCrae found that of the abstainers who had pneumonia 18.5 per cent died; of the moderate drinkers, 25 per cent; and of the heavy drinkers, 52.8 per cent. The drunkards had less chance by far to recover than the moderate drinkers or the abstainers.

Experiments conducted at Vienna showed that when animals were infected with tuberculosis the animals that were not given alcohol stood the best chance to recover. Records kept at the Henry Phipps Institute in Philadelphia show that the alcoholic patients did not respond to treatment as well as those who were classed as "nonalcoholic."

Parkinson found that when large doses of alcohol or continuous moderate doses were taken, the capacity of the white blood cells to destroy bacteria was decreased.

All these experiments indicate that one way to keep the bodily resistance high is to leave alcohol alone.

**239. Alcohol and safety.** The development of machinery and of modern methods of swift transportation has greatly increased the necessity for total abstinence in the face of modern knowledge of the effects of alcohol. Its use is more dan-

gerous now than when men traveled slowly with the ox or the horse, and did their manufacturing largely by hand. The railroad engineer must possess power of immediate and keen attention, quick and correct decision, clear vision for colors, and keen hearing for sound signals. Both vision and hearing must be proof against distractions caused by other sights and sounds, for experiments have shown that response to any one signal is apt to be disturbed by another sense impression going to the brain at the same time. He must be ready to make quick and accurate combinations of movements.

The railroad engineer who used alcohol would see his signals less clearly, interpret them with more difficulty, hesitate in his decisions, be less the master of the speed and certainty of his movements, and carry out his orders less well than the abstainer, under otherwise like circumstances. Hence American railroad engineers voluntarily required total abstinence of themselves long before national prohibition came into effect.

The railroad managements for more than twenty years have had rules forbidding drinking by train operatives that practically require them to be total abstainers. Nobody today would want to trust his life to a drinking engineer or to a railroad whose operatives drink.

The motor vehicle has made another requirement for sobriety in transportation service. Modern conditions in streets and highways, caused by the enormous increase in the number, speed, and power of motor vehicles, make it necessary that a driver be constantly on the alert to avoid sudden obstacles, to guard against unforeseen occurrences, to adapt his driving to the rights of others in passing and meeting. He is likely to need even more power of quick perception and decision than the railroad engineer, whose route is more systematized and uniform. The driver of a motor vehicle has even more reason for the avoidance of alcohol than the loco-

motive engineer, although with the latter an accident is likely to injure a greater number of people.

Water routes are less congested than the land roads and do not make as sharp demands on quickness and precision; but unforeseen dangers do arise, and if they are not met with coolness and good judgment the consequences are likely to be even more serious. Here alcohol is likely to cause hasty, ill-considered decisions and to increase recklessness and errors in calculation and judgment.

A series of interesting experiments was carried out recently in Boston by Dr. Walter R. Miles with drinks containing no more alcohol than there is in weak beer. The test was similar to that of steering a ship by compass. The experiments showed that after taking about two pints of this 2.75 per cent alcoholic drink the movements of the ten operators averaged about 14 per cent less accurate than when they drank the same amount of water.

Candidates for the post of air pilot have to pass a rigid examination which excludes those who are not well qualified by nature; but the almost certain fatality in case of accident, the constant strain of attention, and the necessity for coolness and good judgment when anything goes wrong make it absolutely essential that no such handicap as alcohol should ever be permitted.

In all these considerations the question of visible drunkenness does not enter at all. That condition would not be tolerated by anyone. A British committee of physicians asked to define drunkenness reported that anyone may be considered to be drunk who is unfitted by the liquor he has taken to do properly the particular work he is engaged in at the time. It is the slighter stages of intoxication that carry the danger in swift transportation — effects so slight that a mere observer would not notice them. It is the higher powers of the mind that are called into action in these occupations, and

these powers may be unfitted for the necessary action before any changes in speech or walk, the usual symptoms of oncoming drunkenness, are observable.

As a result of the study of all these facts of modern life and of the knowledge of alcohol it is impossible not to draw the conclusion that sobriety is necessary to safety.

**240. Alcohol as an enemy of athletics.** In 1924, representatives of the French athletic federations, including the French Olympic Committee, passed a series of resolutions condemning the use of alcohol in sport. One statement asserted that "thirty years of practical athletics, of testing, of national and international competitions, in all the domain of human muscular activity, boxing, cycling, fighting, jumping, football, swimming, walking, mountain climbing, flying, have furnished proof, a thousand times verified, a thousand times certified by the most illustrious champions, that for athletes alcohol is an enemy to strength, to speed, to endurance, and to resistance to fatigue."[1]

This attitude on the part of French athletes toward the drinking of alcohol can be duplicated in America. No athlete of reputation would recommend the drinking of intoxicating liquors to those who wished to excel in sports and games.

**241. Alcohol and success in business.** Probably there is no reliable and successful business man in America who would recommend to the youth starting out in life today the forming of the alcoholic habit. Anything which interferes with mental efficiency must necessarily hinder one's success in business, where one needs good judgment, keen observation, accuracy, reliability, and endurance.

Experiments relating to business show what a hindrance alcohol may be. Dr. Walter R. Miles tried out an experiment in typewriting with five young men who used alcohol moderately. Two different doses of alcohol were used. The

[1] *L'Abstinence*, June 28, 1924.

smaller one was about two-thirds of an ounce; the larger, a little more than one ounce. These doses were slightly varied according to the weight of each man. The alcohol was diluted so that the liquid taken contained from 14 to 22 per cent of alcohol. In most of the experiments the 22 per cent dilution, or the equivalent of strong wine, was used. The work done on alcohol days was compared with that done on days when no alcohol was taken.

The results show that even a moderate amount of alcohol tends to impair efficiency in this kind of work. Dr. Miles in summing up says, "In absence of proof to the contrary it must be assumed that the average typist, as a result of taking such quantities of alcohol as were taken on a comparatively empty stomach, will tend in the hour or two following such a drink to make from 25 to 50 per cent more errors in his work than if he had taken an equal volume of water."

**242. Alcohol a habit-forming drug.** One of the striking differences between the use of alcohol and the consumption of food is that alcohol is capable of producing an insistent desire for larger and more frequent amounts. Food and nonalcoholic drinks have no such effect. They satisfy the hunger or thirst for which they are taken, until the body needs new supplies. Alcohol and the other so-called "habit-forming" drugs are taken not to satisfy any normal need, but to produce an artificial relaxation which for a short time gives a peculiar feeling of well-being, due to the beginning of a paralyzing effect on the higher nerve centers. In a social gathering this feeling manifests itself as a lessened restraint, a lessened feeling of responsibility, heightened gayety, or even recklessness.

People who enjoy this "don't care" state of mind want to repeat it; but with frequent repetitions the nervous system gains some power to resist the paralyzing action, and larger and larger doses are required to produce the desired feeling. The desire for the effect grows at the same time more insist-

ent, and the moderate user who yields to it becomes, sooner or later, the immoderate user. This abnormal desire for the drug effect of alcohol may be known or suspected by dissatisfaction with nonalcoholic drinks. If one becomes aware of it before it grows too strong, he may be able by the use of firm self-control to resist it. But the self-control must be exercised when there is no alcohol circulating in the blood, for the effect of the first glass is a partial paralysis of the higher centers of the brain, on which the power of self-control depends. At the same time judgment and self-criticism, also dependent upon the higher brain centers, are beginning to be weakened, and the drinker is unconscious of his failing powers.

Here is the chief danger in the use of alcohol: its power as a drug to put to sleep the very faculties that must act as sentinels to guard the body against it.

**243. Tobacco a poison.** Although there may be a wide difference of opinion as to the effect of using tobacco, nobody denies that tobacco contains a powerful narcotic poison called nicotine. The percentage of nicotine present varies according to the brand of tobacco and the conditions under which it is prepared for use. So powerful is nicotine that painstaking experiments by excellent investigators have shown that there is sometimes sufficient nicotine in an ordinary cigar to kill two men. It is clear that a very large proportion of this nicotine is not taken up by the body, otherwise its effect would be more obvious than it is. Investigation, however, shows that nicotine is found in tobacco smoke. In the case of those who are unaccustomed to smoke or to chew tobacco, it causes symptoms such as mild collapse, pallor of the skin, nausea (perhaps vomiting), and dizziness. These symptoms are common in all nicotine poisoning. This suggests that some of the nicotine is actually affecting the body. While nicotine is the chief poison, the smoke of tobacco also contains other

poisonous substances such as pyridine, collidine, carbolic acid, furfural, and carbon monoxide. Though these are present in but small amounts, when they are absorbed with the nicotine day after day by the smoker they may add to the poisonous action of the nicotine.

A Russian investigator, Zhebrovski, by means of a very ingenious apparatus, compelled rabbits to smoke cigarette tobacco from six to eight hours daily. Some of them died within a month. Others seemed to establish a kind of tolerance for the tobacco such as is found among habitual smokers. But when they were killed at the end of five months, bodily conditions similar to those produced by the injection of nicotine were found. One of these was the hardening of the arteries.

**244. The effect of tobacco on the body.** The study of the tobacco problem by some of the world's best scientists shows that the use of tobacco, especially when used freely, tends to injure the smoker seriously in various ways. Among effects found are some disturbance of the blood pressure, rapid heart action, shortness of breath, palpitation of the heart, and pain in the region of the heart. Although tobacco heart is sometimes spoken of lightly because the symptoms usually disappear when the tobacco habit is discontinued, it sometimes causes death. This may happen when there is some severe physical strain or some acute disease, like pneumonia or typhoid. Surgeons have noticed that tobacco users often are less able than abstainers to rally after an operation.

Immoderate smoking is sometimes the cause of insomnia, catarrhal conditions of the nose, throat, and ear, and indigestion.

**245. Tobacco a habit-forming drug.** All those who are favorably inclined to the use of tobacco should remember that there is no reliable medical evidence to show that tobacco exerts any beneficial influence on the human body. It is not a food. It is to be classed with habit-forming drugs like alcohol. Although its evil effects are not comparable to those of

alcohol, people who begin using it often find it hard to break the habit. Much inconvenience and discomfort are often experienced by the smoker who finds himself in a situation where smoking is impossible or would be discourteous. It is a pathetic sight to see the man who calls at a home where tobacco is not used and finds it necessary in a few minutes to excuse himself to smoke a cigarette. Such a smoker is in that stage where he does not control the habit: the habit controls him. Anything which to any extent takes away from the individual his ability to be his own master is dangerous to accept as a friend.

**246. The tobacco habit a hindrance in athletics.** Good breathing is one of the essentials for sustained muscular effort. Athletic coaches soon found that the use of tobacco unfitted men to do their best in athletics, because it interfered with their breathing. This is so well known today that men who play on the big teams are forbidden to use tobacco, particularly during the period of training.

Muscular precision is another necessity for athletic power. Experiments show definitely that the use of tobacco interferes with muscular control. Fisher and Berry found that it interfered with baseball-pitching. In another experiment they also found that it affected the control of the finer muscles in lunging at a target with a fencing foil and in drawing zigzag lines between printed lines.

The subjects for this study were all college students leading healthy, active lives. For the purpose of comparison there were seven smokers and seven nonsmokers. The smokers were men who probably smoked no more than twice a day. This smoking was usually discontinued during certain seasons because of training. Most of the nonsmokers had never used tobacco.

As a result of this carefully conducted experiment it was found that "all smokers showed a loss in physical precision immediately after smoking."

**247. An expensive habit.** The habitual user of tobacco spends money every day for tobacco. In our time, when habits of thrift are being encouraged, this seems a questionable habit. The amount spent yearly for tobacco by even moderate smokers would amount to a respectable sum if put into the savings bank. If spent for books, travel, and other wholesome pleasures it might contribute much to knowledge and positive health.

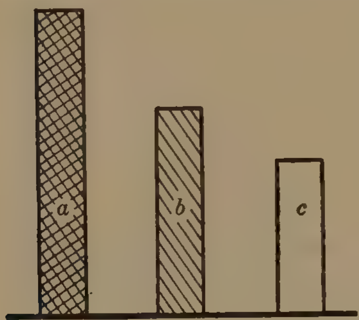



FIG. 95. Students who failed to get a diploma

The results of a painstaking investigation of students at Antioch College showing *a*, heavy smokers; *b*, lighter smokers; *c*, nonsmokers. (Courtesy of J. Rosslyn Earp)

**248. Harmful to the youth.** Although there may be an honest difference of opinion about the harmfulness of the tobacco habit in the life of the adult, there can be no question about the youth. All reliable medical authorities are agreed as to the undesirability of cigarette-smoking and all other uses of tobacco by high-school students. Evidence goes to show that students who smoke do not do as good work in their studies as those who do not use tobacco. High-school students who have investigated the matter for themselves have often found that the habitual smokers among them on the average received lower marks and were older than their nonsmoking classmates. Smoking is a positive hindrance in athletics. The example of the high-school student who smokes often encourages the formation of the habit by younger boys, upon whom the effects are unquestionably detrimental, physically and mentally.

**249. The careless smoker often the cause of fires.** Dealing with fire always has an element of danger in it unless the greatest care is used. Thousands of forest fires are started every year by campers who do not put out their fires or who

throw down cigars or cigarettes carelessly. Many fires in buildings also are started by careless smokers.

**250. Other narcotics.** In addition to alcohol and tobacco, there are other narcotics which are more immediately dangerous to human life and happiness. Chief among these is opium. The source of opium is the coagulated sap of the capsules of different species of poppy, grown chiefly in India, China, Turkey, and Persia. Morphine, the principal active substance in opium, has been separated from the cruder product of opium. Heroin is a dangerous drug manufactured from morphine. It is reported now, however, that it is being manufactured from coal-tar products. Cocaine is usually made from the leaves of the coca plant, although it is also being made now from coal-tar products.

All these drugs dull or stop consciousness of pain and part of its effects on the system, and for that reason they are used in some cases in the practice of medicine. But the conscientious physician gives them for only the shortest possible time because he knows the danger of establishing the drug habit. Although they do deaden pain, they may have a poisonous effect in interfering with the normal action of the cells of the body, especially the cells of the nervous system. They tend to create in the user a craving for them and to paralyze the power of self-control so that the victim who begins the habit soon finds that he cannot stop. A change in his character often takes place rapidly. The problem of securing the drug becomes foremost. The addict may lose his self-respect, honor, ambition, and truthfulness. To get the drug he will sometimes lie, steal, and commit crime.

The dangers from the use of these narcotics are so great that, through the initiative of the United States, an international opium conference was held in Shanghai in 1909. This was followed by a second and third conference at The Hague in 1912 and 1913. The League of Nations is taking an active

interest in international coöperation looking toward the control of this hideous traffic, for it is now a world problem. One difficulty in the solution of this problem is the great financial profit gained by nations and individuals in this traffic. The influence of financial interest in spreading the drug habit is shown by the fact that Dr. Carleton Simon, former special deputy police commissioner of New York, estimated at one time that while fifty-eight ounces of heroin were lawfully prescribed by the medical profession in the city of New York during a period of twelve months, seventy-six thousand ounces were consumed. Smuggling and illegal selling are difficult to detect, especially since the evil effects of these narcotics are not appreciated by people in general.

A legislative committee appointed by the New York legislature sums up the case as to narcotic drug addiction as follows: "The cause is ignorance, the consequences misery, the remedy education." Every intelligent person understanding the appalling consequences of the use of habit-forming drugs will rigidly let them alone.

**251. Form health habits instead of drug habits.** Drugs should be taken only on the advice of a reliable physician. Experimentation with drugs and drinks offered by strangers should be avoided. We should learn to meet bravely every situation involving pain. Most pain is due to removable causes. Nothing but their removal constitutes a real cure. This should lead us to avoid pain-deadening drugs.

Although drugs, when properly administered by a physician, may be helpful, the general habit of taking medicine whenever one feels the least bit below usual efficiency is a dangerous practice. It is better to rely on good health habits, such as eating plain nourishing food, getting wholesome recreation, living as much as possible in the open air, and drinking plenty of water. Physicians are more and more prescribing right habits of living instead of drugs.

**252. Misleading patent-medicine advertisements.** Someone has aptly described the American people as "a nation of patent-medicine swallowers." To judge by the amount of space used in newspapers, magazines, and billboards, the owners of patent-medicine panaceas must find that it pays to advertise.

This is a peculiar commentary on the intelligence of the great majority of our people, that when it comes to a question of regaining health they seem to believe everything they see in print. No matter how absurd or extravagant the claims, they will try the thing anyhow, with a childlike credulity that would be amusing if it were not so often tragic.

It would not be so serious if they were simply defrauded of money amounting to hundreds of millions of dollars a year; but, in trying to doctor themselves after reading patent-medicine advertisements, they frequently delay consulting a physician until a serious and perhaps fatal condition has arisen.

So great has this evil become that progressive teachers in our schools are combating it by insisting constantly on the necessity of consulting a reputable physician, and by warning against believing the misleading statements found in most advertisements of proprietary remedies.

There is no magic in drugs. Medicines advertised to cure tuberculosis, cancer, kidney trouble, and heart trouble are frauds pure and simple and have been exposed as such, over and over again.

The following warnings should be observed by every citizen:

Many much-advertised tonics and health builders depend on the alcohol they contain for their effect on the feelings of the user. Thousands of innocent men and women have become victims of alcoholism by taking these seemingly harmless "tonics."

The much-advertised "headache powders" and drugs of that kind depend for their pain-deadening effects on heart-

depressing drugs that are frequently injurious or habit-forming, and sometimes fatal. Thousands of innocent men and women have become victims of the drug habit by taking seemingly harmless headache powders.

The much-advertised dentifrices and mouth washes often make exaggerated and misleading claims, such as curing pyorrhea, killing germs, and so on. No dentifrice will make yellow teeth white. Consult a dentist.

The much-advertised cold cures are misleading and deceptive. They often do much harm by encouraging people to continue their occupations when they ought to be in bed, thus making their own illness more serious and more lasting, and at the same time probably infecting dozens of others with whom they come in contact.

Anti-fat cures and reducing agents frequently contain thyroid extract. This drug should never be taken without the advice of a physician.

Numerous "physical-culture" papers and magazines carry on a relentless campaign against the regular medical doctors. They do a great deal of harm by encouraging people to doctor themselves or to take up some much-advertised quack treatment.

Of testimonials it is well to know that some of these are frauds pure and simple: they were never written by the person named. Some were written by people who felt at the time that they were benefited, but may since have died of the disease mentioned.

### *For Informal Discussion in Class and at Home*

**1.** Collect additional information to show how the custom of drinking alcoholic liquors has changed during the last hundred years.

**2.** Explain why we know alcohol is a narcotic rather than a stimulant.

**3.** Write out a list of the unfortunate effects of the use of alcohol referred to in the previous pages.

4. Write to a railroad or a large business house and inquire about the possibility of their hiring people who are known to drink alcoholic liquor.

5. Write a composition of five hundred words on "Cigarettes and Athletics." Base it upon facts.

6. Report on the present world-wide war against habit-forming drugs.

7. Report on the chapter concerning patent medicines in Fishbein's "Medical Follies."

8. Write to the American Medical Association, 55 North Dearborn Street, Chicago, Illinois, for some of their free literature on the subject of patent-medicine frauds. Give a report to the class.

## CHAPTER XX

### THE CONQUEST OF DISEASE

**253. The battle in the gloom.** Scientists estimate that man has lived on the earth for more than fifty thousand years. Although authentic history goes back no more than five or six thousand years, it is safe to say that man has always been interested in warding off sickness and in being healthy. At the very dawn of history, when science had not yet begun its work and the gloom of ignorance and superstition was almost impenetrable, man had his theories as to the cause of illness. One of the first of these theories, the demonic theory, asserted that illness was caused by evil spirits. It was the business of the primitive medicine man to cast out these evil demons from the bodies of those who were afflicted. This was often attempted by magical ceremonies, such as the beating of drums. Another belief asserted that disease was meted out by an outraged deity to an individual or a race for sins committed. According to another theory illness was due to vapors, or miasma, rising from low, swampy areas. In connection with this miasmatic theory was the belief that disease was generated from the decomposition of organic matter. Even today some people think that the night air is harmful. It was not until the nineteenth century that the real cause of disease was discovered.

**254. The new world under the microscope.** One of the first steps in laying the modern foundation of medicine came through the perfection of the microscope. The researches of Leeuwenhoek and other brilliant investigators revealed an immense world of living things not visible to the naked eye.

At first these new organisms, called bacteria, were largely curiosities. Little by little it became known that this new world was in part friendly and in part a great menace to healthful living. Without these bacteria there could be no decay in the world. Dying plants and leaves, if they did not decay through the action of bacteria, would soon make all life impossible. Bacteria seem to be necessary in making butter and cheese, in tanning leather, and in accomplishing many things in industry. These same forms of life are also responsible for the spoiling of food.

Finally it was discovered that bacteria were a major cause of disease. After thousands of years in which man had been blindly fighting that arch enemy, this discovery is to be regarded as one of the greatest of all scientific achievements if not the greatest. It eventually made possible the control of disease.

**255. The beginnings of modern medicine.** Science is older than bacteriology. Hippocrates, Sydenham, and Morgagni attempted to apply scientific methods to the control of disease and had an honorable amount of success. William Harvey described the circulation of the blood in 1628; Antoine Lavoisier, the founder of modern chemistry, discovered oxygen in 1769; Joseph Priestley discovered nitrous oxide in 1772; Edward Jenner laid the basis of vaccination against smallpox in 1796; René Laënnec invented the stethoscope in 1815; Crawford W. Long performed the first surgical operation with the patient under the influence of ether in 1842. But the really scientific control of disease began with the work of Louis Pasteur, who discovered that certain diseases had a germ origin. Pasteur was celebrated as the discoverer of a treatment for rabies. The word "pasteurization" was coined after his name. Gradually the cause of one disease after another was discovered, until today there are few diseases the origin of which is still unsolved. The control of microörganisms

means the control of many diseases. The successful investigations of the specific diseases, those for which we have remedial or curative agents, have been accomplished only after long periods of labor by large numbers of research workers. It was by the discovery of antiseptics in 1867 that Joseph Lister, at the age of forty, became the founder of modern surgery. Among the other great heroes of modern medicine are Robert Koch, who, at the age of thirty-nine, discovered the tubercle bacillus; von Behring, who first used diphtheria antitoxin in 1890; Niels Finsen, discoverer of the properties of the ultra-violet ray; Madame Curie, discoverer of radium; William Roentgen, discoverer of the X ray; Walter Reed, discoverer of the cause of yellow fever, and General William C. Gorgas, conqueror of that disease; Paul Ehrlich, discoverer of salvarsan; Bela Schick, famous for the discovery of the test to determine immunity or susceptibility to diphtheria; William H. Park, renowned bacteriologist, for his work with toxin-antitoxin; the Dicks, who paved the way to immunization against scarlet fever; and Frederick G. Banting, who discovered insulin for the

FIG. 96. Madame Curie

Discoverer of radium, which has worked miracles in the cure of disease

treatment of diabetes. The list of these heroes and heroines is legion. Many scientific men lost their lives because of their zeal. The battle is still going on, and will probably continue until every disease has lost its terrors and been vanquished.

**256. Two types of disease.** All diseases may be classified roughly into two great groups. One form of disease cannot be transmitted from person to person; these are sometimes referred to as degenerative diseases. Bacteria are not directly responsible for such diseases. Among such illnesses are heart disease, kidney disease, hardening of the arteries (arteriosclerosis), and diabetes. Many of these diseases occur in middle life, when the body is often weakened by the strain of long-continued work or unhealthful habits.

Communicable diseases are those that can be transmitted from person to person. Every contagious disease is caused by some form of microörganism. These are catching because the microörganisms which cause them are transferred in some manner from the sick person to the well but susceptible person. Among the communicable diseases are typhoid fever, pneumonia, and influenza. Contagious and infectious diseases are preventable.

**257. How bacteria appear under the microscope.** Since bacteria play such an important place in the life of man, it is desirable to know as much as we can about them. Bacteria, or germs, are a very low form of plant life. They are the simplest forms of life that we know anything about. They are all so small as to be invisible without the use of a microscope. Ten thousand of them laid end to end would on the average reach about an inch. About five hundred million of them could be placed flat on a coin the size of a quarter. Students of biology found it necessary to use a new and special unit of measurement in this field of work. This unit is called a micron and is one twenty-five-thousandth of an inch long. Some bacteria are so tiny that we have not yet been able to see them

with the highest power of microscope. We only know that they exist because of their activities.

Each bacterium consists of a single cell, but this cell performs all the necessary functions in order to live. It breathes, absorbs food, excretes waste products, grows, and reproduces just as well as any kind of plant. The reproductive process is very simple. A germ grows until it reaches maturity and then divides into two germs, which, in turn, grow again and divide into two more. Under very favorable conditions a germ may grow to its full size and divide in about half an hour. It is easy to see how at this rate a single germ could speedily number a million.

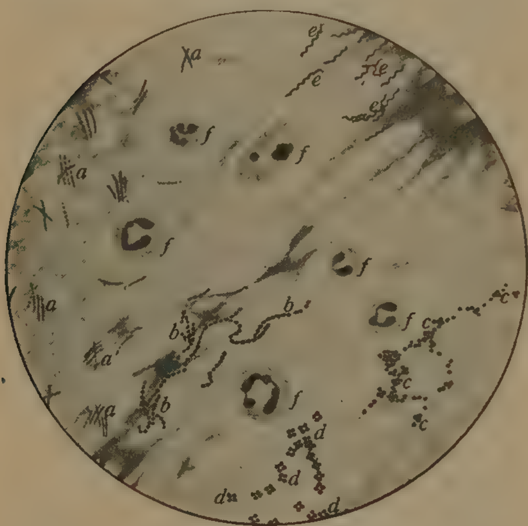


FIG. 97. Different kinds of bacteria as they appear under the microscope

*a*, tubercle bacilli (rod-shaped); *b*, streptococci (in long chains); *c*, staphylococci (clusters like grapes); *d*, diplococci (in pairs); *e*, spirilla (corkscrew-shaped); *f*, white blood corpuscles (the phagocytes or disease fighters)

As seen under the microscope bacteria have different forms and shapes. The coccus is shaped like a berry or billiard ball. When these bacteria are in pairs they are called diplococci; when they occur in chains they are known as streptococci. The staphylococci appear like a bunch of grapes. The staphylococci and streptococci are the chief pus-producing germs. The bacilli are pencil-shaped, and the spirilla look like corkscrews.

**258. How disease is transmitted.** *Through human beings.* The chief menace to public health is the person who is ill

from some communicable disease. Direct contact with such a person is always fraught with danger. All body discharges from a sick person should be destroyed, dishes should be sterilized, and clothing should either be destroyed or made sterile.

Not only sick people but healthy persons who have had a disease may endanger the health of others: people who have had typhoid fever, diphtheria, and scarlet fever may harbor these germs of disease for months and even years.

It is estimated that in New York City alone there are over fifty thousand carriers of diphtheria. Many of these individuals have never had the disease themselves and yet are able to disseminate this disease among susceptible people with whom they come in contact. The recognition and control of chronic disease carriers is an important health problem.

One of the most conspicuous disease carriers in the history of public health was the cook known as "Typhoid Mary." Between 1902 and 1907 she was employed in six different families and was the means of infecting with typhoid fever twenty-six persons in all. In 1907 it was found that she was a typhoid carrier and she was detained, but was released by the authorities with the understanding that she would no longer handle food. She was then lost sight of; but in 1915 it was discovered that there were twenty-five cases of typhoid fever in the Sloan Hospital of New York, where it was discovered she had been employed. Many epidemics were traced to her. Finally she was permanently detained by the authorities on Welfare Island in the East River, New York.

The story of Typhoid Mary shows how important it is to have food handled by healthy persons and by those who are cleanly in their habits. Many cities require those who handle food to pass a thorough physical examination.

*Through animals and insects.* Animals may suffer from diseases that are directly or indirectly transferable to man. Among these diseases are anthrax, intestinal parasites, tuber-

culosis, glanders, and bubonic plague. Some animals are mere mechanical carriers, such as flies, that come in contact with human and other kinds of filth and then perhaps transfer it directly to dishes or to food which is eaten. Mosquitoes, lice, rats, fleas, and the tsetse fly are other mechanical carriers. To destroy these creatures or to prevent them from coming in contact with man would prevent much illness.

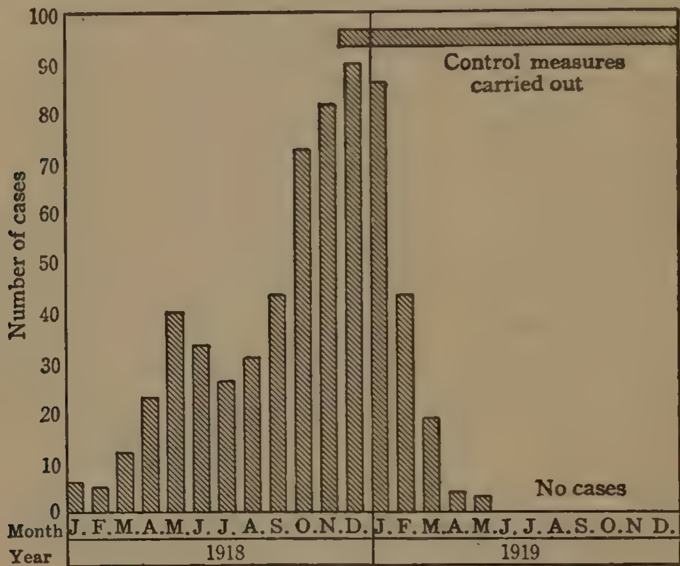



FIG. 98. Science eliminates yellow fever

This graph shows how rapidly yellow fever disappeared at Guayaquil when a successful fight was made against the stegomyia mosquito

Some animals carry germs within their own bodies. They are then said to be hosts for disease germs. As they come in contact with susceptible individuals they may deposit bacteria in their tissues and so cause disease. Certain species of mosquitoes carry malarial and yellow fever, but only after they have bitten people having these diseases. Carefully screening such patients from mosquitoes and destroying the breeding places of these insects have made health usual in places where disease was formerly general.

*Through the air.* It is now known that bacteria may be carried in the air through air currents. In 1897 Flugge established the fact that air may convey microörganisms not only when dry, as in dust, but also in the form of fine droplets of moist sputum, or spit.

The importance of this method of carrying disease has been greatly exaggerated. Microbes are parasites. They prey on human bodies or other animals. They may and often do survive for a time outside the body, but only for a time. Disease-producing bacteria, except the tubercle bacillus and tetanus bacillus, when found outside a human or animal body, are nearly always dying with great rapidity. In dust and air parasitic microbes speedily perish. For this reason it seems quite probable that dust has been greatly exaggerated as a means of conveying disease. Ordinarily bacteria must be transferred with rapidity from one person to another if the disease is to be transmitted. Dust, however, acts as an irritant to the skin and air passages and offers some chance for conveying disease, so that it should be prevented and avoided as much as possible.

*Through droplet infection.* Contact with crowds, especially in close, badly ventilated places, is favorable for the transmission of disease. The chief danger is from droplet infection. Germ-laden particles of mucus and saliva are discharged into the air in the act of talking, coughing, and sneezing. These droplets may rise as high as six feet or more in the air, where they may float about for some time. The distance to which they may travel depends on the force with which they are expelled, the nature of the air currents, and the size and weight of the droplets. Germs remain alive for a longer period in the dark than in the light. Direct sunlight soon kills them. For this reason it is desirable, especially during the winter when colds are so common, to avoid crowded places. It is a good plan to walk in the open air whenever

it is convenient. Infection is less likely to occur out of doors because of air dilution and the germicidal action of the sunshine.

Spitting on floors and sidewalks in public places is now usually forbidden by law as a filthy and dangerous habit. Not attempting to cover a cough or sneeze with a handkerchief has not yet been made a crime. It may be. All schools that are attempting to safeguard the health of their pupils regard any such behavior as a serious offense. Many boards of health have a rime which runs as follows:

> Cover your sneeze,
> And help prevent the spread of disease.

*Through foods.* Since many diseases are contracted by way of the digestive system, keeping foods free from contamination is very important. Polluted water is one of the most common ways of transmitting such diseases as typhoid, dysentery, and cholera (see Chapter XXVI).

Milk, because it is a liquid and also a food, is a favorable medium for germs. It may be responsible for the transmission of pathogenic, or disease-producing, germs from cows to man. Tuberculosis and foot-and-mouth disease may be transferred in this way. Milk may easily be contaminated also by disease carriers and by persons who are unclean in their habits. Septic sore throat, diphtheria, typhoid fever, and scarlet fever may be transmitted in this way. Diarrhea in infants is often caused by a contaminated milk supply (see Chapter XXVII).

Shellfish from polluted waters may cause epidemics. Oysters taken from beds polluted by sewage may cause typhoid. Since the careful supervision of grounds from which oysters may be taken, disease due to this cause has become rare. It has also been shown that oysters even from contaminated sources may be rendered harmless by storing them for a time in chlorinated sea water.

Because of a disease in the animals or because of questionable methods of handling, meat may be dangerous. In large measure this danger may be prevented by government inspection of meat and also by cooking, which kills the germs.

Botulism is a form of poisoning which may sometimes result from the eating of decomposed meat and spoiled canned food.

International Newsreel

FIG. 99. The airplane helps man

The airplane is now being used to oil streams and kill malarial mosquitoes (anopheles) and to spray potato plants to protect the food supply. It is shown above spraying cotton plants against the boll weevil

**259. The routes of infection.** The body is admirably adapted to resist the invasion of disease, but there are certain gateways that need to be especially guarded. A knowledge of these gateways helps us to protect ourselves.

One of the common routes of infection is through the skin and mucous membrane. These membranes protect the body in much the same way that bark protects a tree. The slightest scratch or wound of the skin makes infection possible.

Even the slightest abrasion of the skin should be cleansed with soap and water and have an application of iodine or mercurochrome. Even the tiniest scratches and wounds when uncared for sometimes lead to the most serious consequences.

The tonsils and adenoids, especially if diseased, are important points of entrance for many infections. They are usually the seat of invasion of scarlet fever and diphtheria. Diseased tonsils and their pathogenic bacteria are frequently the cause of rheumatic fever, arthritis, kidney disease, heart disease, chorea (St. Vitus's dance), and sinusitis. The tonsils and adenoid tissue have so often been found responsible for the various ills which human beings have that no reputable physician overlooks them in ascertaining the cause of disease when he treats a patient.

It is interesting to note that particular diseases have their own special entries. Many pathogenic bacteria lodge on the surface of the body, but very few of them find a place of entry. If a germ of measles lodges on the skin, it will be without power to produce the disease; but if the same organism lodges on the mucous membrane of the nose or throat of a susceptible person, the disease will develop.

Another focus for infection is the teeth. Abscessed teeth often cause rheumatic fever, arthritis, and changes in the kidneys, heart, and blood vessels.

The digestive tract is another entrance for infection. Cholera, typhoid fever, dysentery, and intestinal parasites are contracted in this way. In infancy tuberculosis is frequently contracted through the use of raw milk from tuberculous cows. Particularly in the case of infants the seat of the tuberculous trouble may be located in remote glands or in the lungs and no trouble be found in the digestive tract, where the germs found entrance.

Bacteria that cause pneumonia and pulmonary tuberculosis enter the lungs through the respiratory tract.

An infection like septicæmia, or blood-poisoning, may be carried to various parts of the body by the circulation.

**260. The destruction of bacteria.** Since disease may be transferred through things that have come in contact with sick people or others that may carry disease, knowledge of the ways of killing germs is important. Until recently the burning of sulphur or some other chemical in sick rooms was thought to be effective in killing germs. This method has now been discarded. In place of that there is a boiling of clothing and bed linen and the careful washing of the walls and furniture of the rooms. Windows are opened, doors are closed, and sunlight and air are permitted to flood the room for at least twelve hours. Strong sunlight soon kills germs, and for that reason it is better to have homes in open spaces. It is a mistake to have homes too much in the shade. It is an advantage to be able to flood rooms with sunlight through open windows.

Probably one of the easiest and safest methods of killing germs is through heat. In laboratories or hospitals this is a common method employed for sterilizing instruments and other materials used in operations. In days gone by it was expected that in case of an operation there would be suppuration, or pus production, in the wound, but today such a result usually indicates carelessness on the part of the surgeon. Now, before an operation the part of the body to be operated upon is treated with alcohol and iodine or some other antiseptic, the instruments and dressings are carefully sterilized, and the physician wears a sterile gown, cap, face mask, and rubber gloves that have been soaked in disinfectants. Precautions are taken to eliminate all possible means of infection.

**261. The isolation and quarantine of people with contagious and infectious diseases.** Since every person who is ill or carries disease is a menace to the health of other people, health departments and school departments are usually very strict in regulations to protect the public. First of all, there is a law

requiring doctors and others to report the disease. In serious diseases like typhoid fever, measles, scarlet fever, and diphtheria the health department insists upon isolation of the patient. This may be accomplished through a contagious-disease hospital or by securing proper treatment at home. Only those who are needed to take care of the patient are permitted to be in the room. Nothing should be allowed to

BOARD OF HEALTH REGULATIONS CONCERNING READMISSIONS TO SCHOOL AFTER CONTAGIOUS DISEASES

Every school teacher or pupil who is a member of a family in which a case of Diphtheria, Scarlet Fever, Cerebrospinal Meningitis or Acute Poliomyelitis has occurred must be excluded from school until readmitted by the Department of Health. Children and teachers with Measles are excluded from school, but are permitted to return five days after the appearance of rash, provided the rash and all catarrhal discharges have disappeared. Those who have had Measles may continue at school. Those who have not had Measles are excluded from school until fourteen days after date of last exposure. Private physicians are authorized by the Department of Health to readmit children or teachers who have suffered from or have been exposed to Measles. In cases of Liberty Measles, Chicken Pox, Whooping Cough and Mumps, only the sick child is to be excluded. In cases of Smallpox, all teachers and pupils residing in the building must be excluded.

School children exposed to an infectious disease will be given a special certificate readmitting them when regulations of the Department of Health are complied with. Applications should be made to the Branch Office of the district in which pupil resides.

FIG. 100. Have you a public-health conscience?

Help to limit the spread of disease by obeying your health department's rules concerning contagious diseases. Are they similar to the above? Exclusion from school or business and proper home isolation are two modern ways of protecting the public

leave the room until it is thoroughly disinfected. The period of isolation varies with different diseases. In cases of acute contagious disease others who have been exposed to the disease and may be coming down with it should be promptly isolated until all danger is past. After recovery the patients are not allowed to go back to school or to associate with others until medical advice shows that it is safe to do so.

**262. How the body protects itself against disease.** Although we are constantly threatened by pathogenic bacteria, we are able to counteract these dangers in most cases because the body is so well adapted to fight disease. The skin, as we have

noticed, offers excellent protection against a multitude of dangers. Tears mechanically wash out the eye, so that it is not often infected. The tears also have a slight germicidal power. Both the saliva and the nasal secretions have germicidal power. The resistance in the mouth is so great that it is seldom that a mouth wound becomes infected. The air passages are also well protected. Hairs in the nose tend to strain the dust from the air. Hairlike bodies called cilia in the air tubes of the lungs also protect against dust. If germs are carried into the lungs they may be walled in by cells and die. Those carried into the digestive tract are combated by the various digestive juices and thrown out of the system with intestinal wastes. If they manage to find their way into the circulation, they stand a good chance of being devoured by swarms of hungry white blood corpuscles.

When bacteria enter the circulation, they manufacture a poison called toxin. The poisonous action of the toxin makes the susceptible person ill. All the cells of the body work to combat these toxins. The cells manufacture a substance called antitoxin which destroys the bacteria and makes the toxin harmless. When the body manufactures enough of this antitoxin, the disease is controlled.

Thus at every point the body protects itself so admirably that we are seldom really ill.

**263. Natural immunity.** When there is sufficient antitoxin in the blood to combat a disease successfully, the person is said to be immune. There are some persons who seem to have a natural immunity to certain diseases. Although such persons have never had a recognized attack of a special disease which would stimulate the production of an antitoxin, they actually have an immunity to that disease and do not get it even though they may associate with one who has it.

**264. Acquired, or active, immunity.** When a person becomes ill with measles, nature begins to produce the antitoxin to

combat the toxin of the specific bacteria causing measles. When a sufficient quantity of antitoxin is produced within the body to counteract the germ causing measles, the person gets well. This measles antitoxin produced within one's body is in most instances a permanent part of that individual's blood; that is, it remains in the system throughout life, and hence we have noticed that a person who has had measles seldom gets the disease again. If, in very rare instances, such a person develops measles again, it is proof that for some reason the system has lost some of the antitoxin. Acquired immunity holds true also for scarlet fever, chicken pox, mumps, whooping cough, and smallpox. One attack, however, of diphtheria, pneumonia, tonsillitis, or "cold in the head" does not protect against a second attack; in fact, one attack seems to predispose to a second attack.

**265. Artificial, or passive, immunity.** When it was discovered that contagious diseases were produced by bacteria, and that in the presence of an infection an antitoxin to combat the specific infection was developed in the system, scientists tried to find out what this antitoxin was. In many instances they found out how to make it, and as a result antitoxins, vaccines, and serums have been made outside the human body either in the laboratory or in animals. These antitoxins can be given to a well person to protect him temporarily against corresponding diseases or, while the individual is acutely ill, to help him fight the disease. The immunity from such antitoxins is called artificial, or passive, immunity. The use of diphtheria antitoxin and scarlet-fever antitoxin offers notable examples of the production of artificial, or passive, immunity. Unlike active immunity, which lasts for life, passive immunity does not protect longer than three weeks.

**266. The war against smallpox.** One of the greatest achievements of medical science has been the discovery of ways to induce nature to manufacture antitoxins in the system and

thus produce an acquired immunity without actually having the disease. For many of the diseases this has been done. Vaccination is the term applied to this form of protection. There are several different methods of performing vaccinations, because there is a different antitoxin required for each specific disease. The fundamental principle is, however, the same in all cases.

Smallpox was the first disease for which vaccination was used to induce nature to make an antitoxin without the person's having the disease. The story of this discovery is one of the most fascinating in the history of medicine.

It was observed centuries ago that if one had had smallpox he was thereafter incapable of having the disease. For this reason many of the Asiatic peoples purposely transferred smallpox. The Chinese sometimes collected on wood the pus from smallpox pustules and placed the pieces of wood in the nostrils of the person to whom they wished to give the disease. In Turkey a still more direct method was used of putting the pus from a mild case directly under the skin. If the resulting illness was slight the person became immune without danger. Unfortunately such practices often started epidemics. The Turkish method continued until Jenner's remarkable discovery.

Among the English dairy people there was a belief that those who had had cowpox did not contract smallpox. To test this theory scientifically Dr. Jenner inoculated with smallpox ten people who had had cowpox. Not one of the ten took smallpox. For further proof he also inoculated a boy with pus taken from the hand of a dairymaid who had previously had the cowpox. Weeks later and again months later he inoculated him with real smallpox pus, but the boy did not get the disease. Since the infectious material in this case came from a cow, it was thereafter called vaccine, and the process was called vaccination (after *vacca*, "a cow").

Since the time of Dr. Jenner the method of vaccination has become safer and more certain because of the great care used in the manufacture of the vaccine and in the process of vaccination itself. In the preparation of the vaccine the same scrupulous antiseptic care is exercised as in a hospital operating room.

Scientists have discovered that if the blood of a calf which has cowpox is allowed to touch a broken place in the skin of a human being who has not had the smallpox, it causes a sore to appear on that site very much like a smallpox sore. A person who in this way has had such a sore will not develop smallpox for at least seven years and sometimes longer, no matter how intimately he may associate with a person who has the disease.

Blood is made up of a perfectly clear serum in which float the blood cells. These cells can be separated from the serum upon standing or when centrifuged. It is now known that if the serum of the blood of a calf sick with cowpox is placed on a broken portion of the human skin, this serum will be absorbed by the system. When absorption begins nature at once begins to fight the cowpox serum by making a smallpox antitoxin. The discovery of vaccination against smallpox is one of many instances in which the intelligence of man has improved on nature.

The Health Section of the League of Nations recently stated that smallpox "is becoming increasingly rare on the continent of Europe." Smallpox is increasing in the United States, however, because of a false belief on the part of many people that there is a danger in vaccination. This belief is held in spite of the facts showing that hundreds of thousands of people are vaccinated every year without any serious harm. In the United States twenty-seven thousand cases of smallpox were reported during the first ten months of 1926. This illness is preventable if people will use the means that science has put within their reach.

**267. Serums from convalescents.** Serums of persons convalescing from certain diseases are used to protect others from developing the same disease, or to cure them. For example, serum obtained from a person convalescing from measles or from one who has had the disease previously will protect against an attack of that disease. This applies also to diseases such as chicken pox, scarlet fever, and mumps.

**268. Diphtheria is preventable.** It was a wonderful day for science when it was announced that diphtheria could be controlled and prevented. It came about as the result of a discovery that a test could be made to find out whether people were immune or not, and that, if they were not immune, they could be made immune against that disease. New York and other cities have led the country in the campaign against diphtheria.

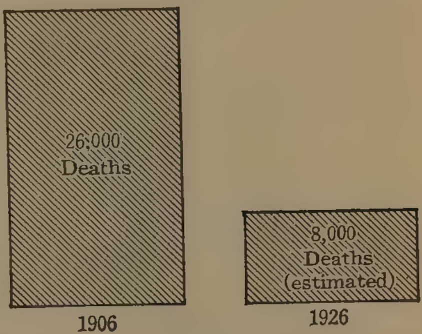



FIG. 101. Diphtheria deaths per 100,000,000 population in the United States

Science is steadily gaining control of diphtheria. In another twenty years we may hope to see it practically disappear

The name which stands out in this great advance in medicine is that of Dr. Bela Schick. This physician discovered that when a few drops of diluted diphtheria toxin were injected between the uppermost layers of the skin there resulted a reddened area in that site of the skin if the person did not have sufficient natural antitoxin against diphtheria in his blood to protect himself against the small amount of toxin injected.

No reddened area follows a Schick Test if a person is immune to diphtheria. This test is absolutely harmless and almost entirely painless, and it is easily administered. It shows with accuracy those who could contract diphtheria if exposed and those who could not. The test alone does not have any

effect whatever on the production of an immunity and is of no value other than to indicate whether or not to vaccinate a child against diphtheria. The method of vaccinating against diphtheria is to inject a small quantity of toxin-antitoxin (a mixture of diphtheria toxin and diphtheria antitoxin) under the

Wide World Photos

FIG. 102. A hero who lived to see his own monument

The dog Balto was the leader in Gunnar Kasson's dog team that carried the antitoxin through the ice and snow to Nome, Alaska, to relieve the diphtheria epidemic there. Millions of people followed the thrilling story in their morning papers. The dog and his master are shown here at the dedication of Balto's statue in Central Park, New York City

skin at intervals of one week. Three inoculations are necessary to develop an immunity. The antitoxin within the body necessary to protect the individual against diphtheria is manufactured very slowly. After vaccination it requires from three to six months for the production of an amount of diphtheria antitoxin necessary to protect against the disease.

It is absolutely necessary to re-Schick-test the individual six months after the last inoculation of toxin-antitoxin. This test in 95 per cent of the cases shows that the individual has been protected. In 5 per cent or less it is necessary to revaccinate with toxin-antitoxin to bring about an active immunity. The toxin-antitoxin treatment will produce, so far as is known at the present time, a permanent immunity to the disease. Toxin-antitoxin is never given to a person already sick with diphtheria or to one who has just been exposed to the disease.

The distinction between toxin-antitoxin and diphtheria antitoxin must be borne in mind. Diphtheria antitoxin is administered to those already stricken with the disease and to those intimately exposed to it. Used in this way, antitoxin cures the sick ones and immunizes those exposed. This protection, however, lasts only three weeks or less, after which time the passive immunity is lost, and the disease can be contracted again. On the other hand, toxin-antitoxin, when it is administered to well persons, produces active immunity, which protection lasts for life.

**269. The conquest of scarlet fever.** In 1923 two doctors, G. F. Dick and Gladys H. Dick, working in the McCormick Laboratory of the Hospital for Infectious Diseases at Chicago, discovered a test similar to the Schick Test for diphtheria, to determine immunity or susceptibility to scarlet fever. Their discovery was heralded as a new weapon with which the medical profession could combat scarlet fever. Following the discovery of this test came the use of scarlet-fever antitoxin, obtained from horses in the same manner that diphtheria antitoxin is produced. For those individuals known through the Dick Test to be susceptible to scarlet fever, active immunity should be instituted; that is, small doses of scarlet-fever toxin should be inoculated hypodermically at weekly intervals and in increasing doses for four weeks. They should be retested at the end of six weeks to determine whether or

not immunity has been established. For the treatment of severe cases of scarlet fever, scarlet-fever antitoxin should be employed. Those intimately exposed to the disease should be Dick-tested, before scarlet-fever antitoxin is used, to determine immunity or susceptibility.

**270. Common colds.** One of the most common ailments is a cold. A cold is ordinarily an acute inflammation of the mucous membrane of the nose. Many colds cause little trouble, but often this inflammatory condition in the nose spreads to the ear, sinuses, throat, bronchi, and the cells of the lungs. Colds are due to a variety of germs. Therefore what is dismissed with the jocular phrase "Oh, it's only a cold" may be the beginning of a serious illness if it is not dealt with promptly and effectively.

**271. Avoid infection from colds.** Colds may be considered as infectious diseases and are combated in a general way like most diseases. Since colds may be communicated by droplet infection and contact, it is wise to avoid people who have colds and to be careful about washing the hands before eating. Only food and the toothbrush should be put into the mouth.

**272. Treatment of colds.** To recover from a cold one should give the body the best possible chance to fight the infection. On contracting a severe cold it is desirable to go to bed. Food should be taken as the appetite dictates, plenty of water should be drunk, and the window should be kept open. If people on contracting a cold would go to bed for three days, they would not only recover much more rapidly but would also prevent the spread of infection.

**273. The prevention of colds.** In addition to avoiding infection, colds may be prevented to a great extent by hygienic living. Avoiding undue fatigue, living in the open air as much as possible, avoiding drafts, eating proper foods, and attending to the regular elimination from the bowels are some of the

desirable habits to help prevent colds. Even if such habits do not result in complete prevention, they doubtless enable one to recover more quickly from a cold. Some physicians advocate inoculations against colds. While some people seem to be helped by them, they appear to have doubtful value. Recent studies, contrary to popular belief, indicate that climate has apparently nothing to do with colds. The students in Stanford University, in a mild climate, seem to have as many colds as the students in Harvard University.

**274. The romance of surgery.** The ease and safety with which operations are performed today is one of the outstanding achievements of this marvelous age. Within the memory of many now living it was thought to be homicidal to perform an abdominal operation. Today an operation for appendicitis is commonplace. The patient after a successful operation returns to work in about three weeks without any serious discomfort. Modern skill in surgery is so great that today serious but successful operations are performed on the stomach, intestines, lungs, kidneys, brain, and heart. Thousands of people who would have died or suffered from ill health have been restored to good health. The wonders of modern surgery can be fully appreciated only when projected against the gruesome history of the past.

Before the discovery of anæsthetics surgery was a horror. Operations were dreadful ordeals both for patients and surgeons. The awful shrieks from the hospital operating rooms filled those waiting for their turns with a nameless horror. People preferred to remain ill or die rather than to undergo operations. In Europe surgery was left for centuries largely to barber surgeons and itinerant quacks. Patients were sometimes hypnotized, or given large quantities of alcoholic liquor to produce intoxication. From the earliest time physicians were vainly experimenting in the hope of finding something that would dull consciousness and eliminate pain.

The chemical discoveries in the latter part of the eighteenth century provided nitrous oxide, which incidentally was found to destroy pain. In spite of the fact that some successful operations were carried out on animals, the medical profession and the laity did not heed these demonstrations, and surgery continued to be a torture. Nitrous oxide and sulphuric ether were seized on by the populace, who found in them a pleasant means of exhilaration. Itinerant lecturers on the marvels of the new chemistry gave demonstrations throughout the country and made their meetings popular by getting young people to breathe ether. Meanwhile the audiences roared with laughter over the antics of the unconscious. A fashionable form of amusement at parties was to have "ether frolics," at which the participants became intoxicated from the inhalation of ether.

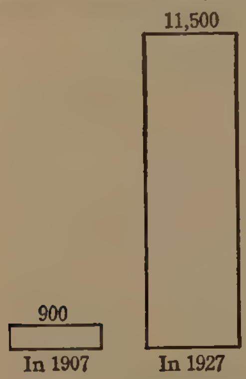



FIG. 103. The increase in the number of public-health nurses in the United States over a period of twenty years

At this time Dr. Crawford W. Long was practicing medicine at Jefferson in Jackson County, Georgia, many miles away from a railroad. He noticed that when people were under the influence of ether they sometimes sustained slight injuries. They uniformly assured him that they at no time felt any pain. These observations led him to believe that anæsthesia was produced by the inhalation of ether and that it could be used successfully in operations.

At this time a Mr. James M. Venable consulted Dr. Long about having two small tumors removed from the back of his neck. He kept postponing the operation because of his fear of the pain. On the suggestion of Dr. Long he consented to have one of the tumors removed while he was under the influence of ether. He gave no evidence of suffering, and after it

was over said that he had experienced no pain. This first successful attempt with ether to render a patient insensible to pain was performed on March 30, 1842, an epoch-making day in the history of surgery. A most important step in the progress of modern surgery had been successfully taken.

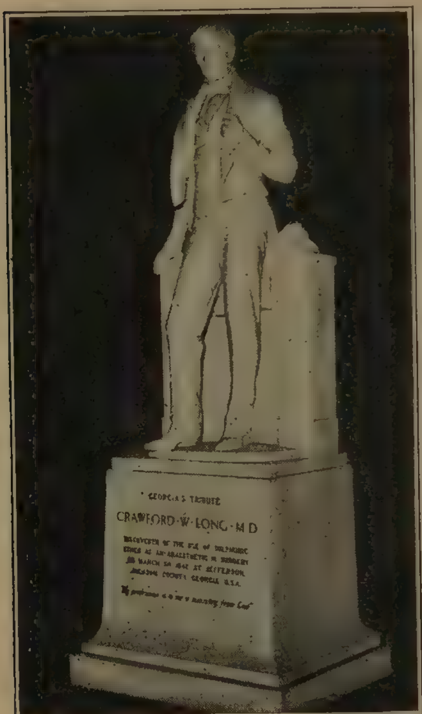
FIG. 104. Safety in surgery

Under modern conditions of cleanliness there is little danger or pain in a surgical operation. Notice that the surgeons in their preparation wear masks to prevent infection. (By courtesy of the Cambridge Hospital)

Dr. Long was a modest man and did not rush into print. Without knowing about this discovery other men successfully experimented with ether. In 1846 Jackson and Morton united in claiming the discovery, but after much unfortunate controversy the priority of the claims of Dr. Long has been recognized. Within a few years surgery became more popular, and splendid new conquests over disease were reported. This advance was not rapid, however, until after Pasteur's great

discovery that germs were the cause of disease and Lister's announcement of the discovery of antisepsis in 1867.

Joseph Lister found the conditions in the English hospitals revolting. Hospital practice sixty years ago was disgustingly filthy as compared with the cleanliness of modern operating rooms. Hospitals were often a menace. Gangrene was so prevalent that a slight wound which might have healed if it had not been neglected would develop in the hospitals into a serious and often fatal infection. Before the discovery of anæsthetics surgery had to be undertaken with great speed. Instruments were often used without any cleaning except dipping into a basin of cold water and wiping on a towel. If it was a complicated case the surgeon frequently held small instruments in his teeth or in his pocket for the sake of convenience. Infection was universal, so that all wounds were expected to suppurate. Lister's experiments with carbolic acid brought about a great improvement in surgery. He urged the necessity of preventing infection by not permitting germs to enter the open wound either on the surgeon's hands or on instruments. This technique of aseptic surgery, developed to such a remarkable extent in the modern operating room where instruments, bandages, and everything pertain-




Harris & Ewing

FIG. 105. Dr. Crawford W. Long, the first man to make surgery painless

This statue was unveiled at the Capitol at Washington, D. C.

ing to the operation are sterilized and made aseptic, was the capstone of the work of Long fifteen years before. Science was now free to continue its conquest of disease through surgery. In honor of his service to mankind Lister later received a baronetcy from the crown, and at last he was made a baron.

| | Number of tests | Percentage positive |
|---|---|---|
| House dust | 1186 | 63 |
| Ragweed pollen | 1176 | 20 |
| Chicken feathers | 1094 | 19 |
| Goat hair | 865 | 18 |
| Duck feathers | 1289 | 17.6 |
| Goose feathers | 1085 | 14.6 |
| Pepper | 371 | 13 |
| Wool | 147 | 12 |
| Orris root | 1160 | 11 |
| Rice | 912 | 10 |
| Wheat | 939 | 8.8 |
| Cat dander | 1083 | 8.5 |
| Tobacco | 874 | 8 |
| Pyrethrum | 932 | 7 |
| Corn meal | 923 | 7 |
| Oat | 899 | 6 |
| Rye | 156 | 6 |
| Horse dander | 1122 | 6 |
| Grass pollen | 1073 | 5.6 |

Less than 5 per cent Positive

| | Number of tests | Percentage positive |
|---|---|---|
| Flaxseed | 789 | 4.8 |
| Dog dander | 1080 | 4.4 |
| Buckwheat | 908 | 3.4 |
| Cottonseed | 875 | 2.6 |
| Horse serum | 643 | 2.6 |
| Rabbit dander | 1036 | 2.5 |
| Mustard | 248 | 2.4 |
| Silk | 101 | 2.4 |
| Fish glue | 818 | 0.7 |

FIG. 106. Results of tests to determine the causes of certain types of asthma

The discovery of the specific cause and the removal of the offending agent have resulted in many cures

**275. Recent conquests.** Since there are so many skilled scientists at work, it is not surprising that a month seldom goes by without recording some progress in the warfare against disease.

Within the last few years diabetes has yielded to treatment with insulin; dogs have been successfully inoculated against rabies, thereby reducing the danger of transmitting the

disease to human beings; sunlight has been found to be a cure for rickets; diseases like pellagra and beriberi have been proved to be due to deficiencies in diet and so preventable and curable; and the causes of hay fever have been discovered and methods of immunization used. Asthma, a disease closely related to hay fever, has also received its share of investigation. Recent investigations have disclosed that certain forms of asthma are due to an extraordinary hypersensitiveness of some people to inhalations of dander of horses, cats, dogs, and other animals; to pollens and house dust; to certain foods; and to other exciting causes. The discovery of the specific cause of the disease and the removal of the offending agent have resulted in many cures. The mere recital of the many achievements would take more space than is available in this book. Two of the more recent conquests are those over pernicious anæmia and poison ivy.

FIG. 107. Common ragweed
The pollen of this weed is one of the most common causes of hay fever

The striking results achieved in the treatment of human cases of pernicious anæmia with diets containing large amounts

of liver in one form or another has been hailed almost as a panacea for a heretofore decidedly intractable and incurable disease. The vigorous regeneration of red blood corpuscles can be brought about by eating liver tissue of several species — beef, sheep, calf, and chicken. This has been accomplished with unquestionable success.

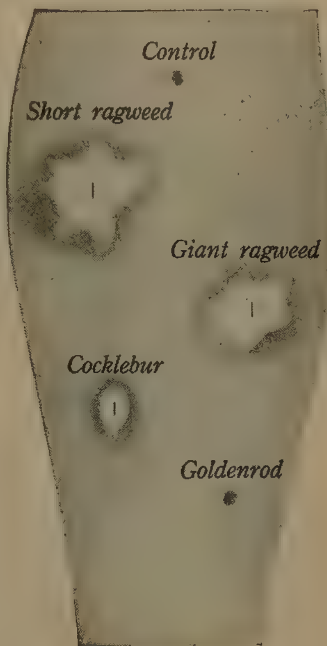



FIG. 108. Skin tests to determine the cause of hay fever

The large irregular wheals indicate that the pollens of both the short and the giant ragweed are the irritating factors that cause hay fever in the person tested

Persons susceptible to ivy poisoning may now be rendered immune by the injection of the active principle of the ivy poison, which chemists have been able to identify. It is called lobinal. Poison-ivy eruption appears on those portions of the skin that have been touched with the sap either directly or indirectly. Poison-ivy eruption is not communicable, but the presence of poison-ivy sap on clothing, a bandage, towel, or handkerchief may cause the eruption, even on a person who has not been near the plant. Probably, too, every part of the plant is irritating. If one touches the stem or the leaf or breaks off one of the roots, it is essential that prophylactic treatment be started immediately with the hope of warding off the disease. Get into a tub of warm water. Wash thoroughly with soap that lathers easily. After a prolonged bath, rub down with alcohol, as the ivy poison is soluble in alcohol. Then rinse again with water. Change all clothing worn at the time of exposure and have as much of it as possible thoroughly washed and dried. Air the clothing that cannot be subjected to washing.

**276. Conquests yet to be made.** The success of science in combating disease since the dawn of scientific medicine about half a century ago is perhaps the greatest accomplishment of this period. Through the control of the anopheles and stegomyia mosquitoes malaria and yellow fever are fast disappearing. Through better methods of sanitation and through vaccination smallpox, typhoid, rabies, diphtheria, and scarlet fever may be prevented. Death rates from the dreaded tuberculosis are fast declining. Despite the prevailing skepticism toward immunity in this disease, for the reason that many claims in the past when subjected to a rigid test failed to meet all requirements, there has been by no means an entire lack of interest in the possibility of immunization. Inoculation against tuberculosis has recently received new consideration as a result of studies by Calmette, Guérin, and their coworkers at the Pasteur Institute, Paris. The immunity against tuberculosis, established through a vaccination of the newborn with Bacillus Calmette-Guérin (BCG), is said to be more than partial. Calmette and Guérin inoculated with BCG vaccine nine hundred and sixty-nine infants who were born from tuberculous mothers or had been in contact with a tuberculous person. In France the

Brown Bros.

FIG. 109. William Roentgen, discoverer of the X rays that have been used so effectively in the curing of disease

Probably there is more to be known about their usefulness to man

average mortality from tuberculosis among infants is about 20 per cent. Among the vaccinated infants for the two years following vaccination the mortality was 1 per cent; it was nil after two years. The resistance to tuberculosis infection lasted more than four years. Hence the infants were immunized for the period when tuberculous infection is most dangerous. It is through such conquests that life is steadily being lengthened.

We may expect further conquests. There is still little relief from cancer except through early detection, surgery, radium, and X-ray therapy. Little progress has been made with respiratory troubles, such as pneumonia, influenza, and colds. Heart disease is still a menace.

Through the patient research of scientists the next fifty years seem full of promise. The conquest may be nearly complete. Then, barring accidents, man will have realized the true goal of hygiene — to live to old age.

### *For Informal Discussion in Class and at Home*

1. Who was the founder of modern bacteriology? of modern surgery? Who discovered the ultra-violet ray? radium?

2. Defend the proposition that legacies should provide funds for medical research.

3. What insect carries malaria from man to man? What methods should you employ to eradicate the disease (1) in a malarial district? (2) in your own city?

4. Name at least six health workers who have aided in the conquest of disease in your generation. Against which disease have they fought and conquered?

5. Who is your local health commissioner? Have the members of your class draw up resolutions petitioning the principal or your hygiene teacher to invite him to address the school on a health subject.

6. What kind of war do you believe in? State the names of recent wars to make the world safe against disease, and give the

names of the research generals in command. For example, Gorgas led the war against yellow fever. Who are some of the others?

7. How can you guard against diseases like smallpox, diphtheria, scarlet fever, measles, typhoid? against heart disease, rheumatic fever, diabetes, kidney disease, rickets, scurvy?

8. Knowing how diseases are transmitted, what precautions are you now taking to maintain your health? Do the members of your family know how? Appoint yourself a family health officer and see that the health rules and regulations are carried out.

9. What scientific means have we of stating definitely that certain people may or may not contract scarlet fever or diphtheria? How successful has your city been in lowering the prevalence of these diseases?

10. What measures does your city take to prevent epidemics of typhoid fever? of smallpox? What is its attitude toward food markets? food handlers? sanitation of soda fountains?

11. Read Fishbein's "Medical Follies." Relate to members of your family those chapters which revealed the most interesting and astonishing everyday facts concerning health.

12. If you owned a dog, what preventive measures would you institute to prevent others from possibly contracting hydrophobia? What is good for your dog should be good for others. Interest your neighbors.

13. For how many years do smallpox vaccinations, typhoid inoculation, and diphtheria toxin-antitoxin safely immunize?

14. Report to your hygiene teacher on the following:

Vaccinated against smallpox . . . . . . Date ______________
Vaccinated against diphtheria . . . . . . Date ______________
Vaccinated against typhoid . . . . . . . Date ______________
Vaccinated against scarlet fever . . . . . Date ______________

# CHAPTER XXI

## WHEN ILLNESS COMES

**277. Knowledge of home care of the sick a necessity.** Through the remarkable advances of medical science in the last fifty years many diseases have become preventable. Yet, in spite of the combined efforts of all individuals and health departments interested in the prevention of disease, we are still confronted with certain illnesses and communicable diseases to which human beings are subject. Illness at some time or other is bound to invade the home. Under such conditions it is desirable to know what is the best thing to be done for the promotion of one's own health and the health of other members of the family.

**278. The home or the hospital.** In recent years public opinion has changed considerably concerning the present-day hospital. Formerly people had fears and superstitions regarding hospitals, but now it is not uncommon for people to seek admission to medical institutions in preference to being treated at home. With chemical and pathological laboratories of research, X-ray and radium laboratories, electrotherapy and hydrotherapy apparatus, trained internes, nurses, and specialists, to mention only a few of the advantages, there is every reason why sick people should prefer hospital care, particularly if their disease requires careful observation, study, and special treatment. Patients requiring surgical treatment should almost always be treated at a hospital. There are very few exceptions to this rule.

There are, however, many mild illnesses that do not require hospital treatment. In many other cases the cost of the

hospital care is prohibitive or hospital care is impossible because of a serious emergency. It therefore behooves everybody to be in a position to know something about disease: its symptoms and meaning, and the care of patients.

**279. Common communicable diseases.** The communicable diseases of the contagious variety are essentially diseases of early childhood, and a child is usually far more susceptible than an adult. The reason for this is self-evident: the adult has passed through the period of childhood diseases many years ago, and his immunity is established.

The transmissibility of the diseases common in early childhood is increased on account of the intimate contact that occurs between children of pre-school and school age. As a rule the frequency of scarlet fever, diphtheria, measles, German measles, whooping cough, mumps, and chicken pox begins to increase with the opening of the schools in the fall, reaches its maximum in the late winter months, and decreases to the minimum at the close of the schools in the beginning of the summer.

**280. Simple records of the sick room.** It is advisable for the attendant to keep simple records of the symptoms shown by the patient and notations of the progress of the disease. A record of the patient's temperature, pulse rate, and number of respirations per minute should be written on a special form or blank for the information of the attending physician. This record should also include reference to bowel action, the emptying of the bladder, the number of hours of sleep, the nature of the food consumed and the amount, the water intake, the hourly record of the room temperature, and any other important items or changes noticed by the attendant.

**281. The selection of a physician.** When it comes to selecting a physician, the greatest care should be exercised. It is usually the custom to be influenced by the recommendation

of a neighbor, friend, or relative regarding the merits and ability of a physician. Anxious as they may be to assist, they are not in the best position to make the final selection.

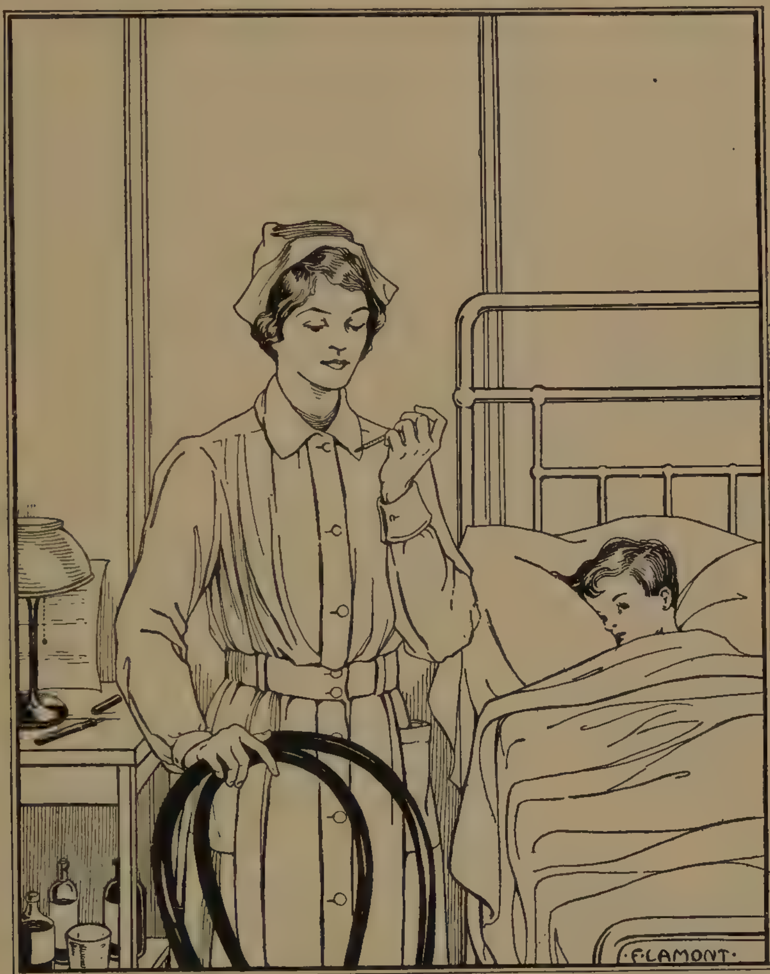



FIG. 110. The graduate nurse insures proper care of the patient

There exists in every community an organization known as the County Medical Society, which is an integral part of the State Medical Society, and all the state medical societies in turn make up what is known as the American Medical

Association. Only reputable and ethical physicians are permitted to become members of these societies. The best way to obtain information concerning a physician is to apply to the secretary of the local County Medical Society for a list of names of physicians living in your neighborhood upon whom you can call for medical and surgical aid. If there is need for a specialist in a particular branch of medicine or surgery, a request should be made for a list of men specializing in that branch of medicine. In addition to this source of information, which is, after all, the best, one can apply to a local hospital for the names of physicians on its staff. A selection made in this way would assure competent service. A physician should be engaged who is well thought of by his fellow practitioners, who exemplifies health himself, who is neat and immaculate in his personal appearance, and who preaches, practices, and prescribes preventive medicine.

**282. Selection of a nurse.** There are many items which enter into the treatment of the patient. The administration of specific drugs is only one part of the general treatment necessary to conquer the disease and restore the patient to normal health.

After a physician has been engaged, the next most important step should be the selection of a trained nurse. She should be selected from the standpoint of personality, general appearance, training, experience, congeniality, and trustworthiness. Trained nurses should be selected not at random, but from registries of nurses' hospital alumni associations of established reputation. The physician in charge of the case is the person with whom the selection of a nurse should be intrusted. In many localities nurses work on a twelve-hour basis, but occasionally one can be engaged for twenty-four-hour duty. In the latter instance the nurse should have sufficient rest at night to make herself useful to the patient during the day. If because of financial reasons a trained nurse can-

not be employed, an undergraduate or practical nurse may be used. If for some reason even this service cannot be had, then the mother is the next best attendant. In this event she should be relieved of other household duties and responsibilities.

The attendant should be clean in person, patient, and cheerful. She should be trustworthy in carrying out the physician's orders, and she should respect matters of a confidential nature. Above all, whether she be a trained nurse, an undergraduate, or the mother, she should be directly responsible to the physician in charge and should be held accountable for all matters pertaining to the care of the patient and the condition of the sick room. In the interests of the patient, all discordant influences, such as those from well-meaning relatives and friends, should be carefully guarded against. Inexperienced persons are apt to cause much confusion and mental anxiety to the patient and immediate members of the family through meddlesome interference.

**283. Selection of the sick room.** The best available room in the house should be selected for the care of the patient. It should be selected from the standpoint of convenience, quiet, warmth, ventilation, and sunshine. All unnecessary furniture should be removed before admitting the patient. All petty annoyances, such as squeaky doors and loud-ringing telephone bells, should be eliminated. The source of any rattling sound should be discovered and removed. The necessity of eliminating outside noises is such an important factor in the treatment of disease that when persons of influence are ill, neighboring street traffic is usually detoured to other highways. The room selected should be as near the bathroom as is possible.

**284. Isolation and quarantine.** Towels, basins, and other utensils used for the sick one, which are often kept in the bathroom for convenience, should be carefully separated from those articles used by the well members of the family.

**285. Ventilation.** The utmost care should be given to ventilation. One should guard against direct drafts. The temperature of the room should not be above 68° F. except in special instances of children treated for croup and bronchopneumonia. In such cases warmer air is desirable. Proper

FIG. 111. A model room in a modern hospital

Courtesy of Mt. Sinai Hospital, New York City

ventilation is best obtained by having the window open both at the top and at the bottom. This permits foul air, which is warm and therefore rises, to be drawn out above and the fresh cool air to be admitted at the bottom.

**286. Lighting.** Direct glare upon the patient's eyes should always be avoided. This can be accomplished by partly drawing the window shades, by having him wear smoked glasses or an eye shield, by changing the position of the bed to obtain

side illumination, and through the use of screens attached to the lighting fixtures. Proper lighting adds much to comfort.

**287. Cleaning.** The raising of dust to the level of the patient's nostrils must be avoided. Damp or oiled cloths or mops should be used in place of dry sweeping. A vacuum

FIG. 112. Clean linen adds comfort

The patient's comfort is of the utmost importance. The bed linen should be fresh, immaculate, and smooth. Frequent changes are desirable

cleaner is more satisfactory and should be used whenever possible. Cleanliness is one of the first laws of the sick room.

**288. General care of the patient.** Irrespective of the nature of the illness, the patient should be isolated as completely as possible from the other members of the family until entirely recovered. Since the patient must be confined, often for a considerable length of time, his comfort should be uppermost

in the mind of the attendant. The bed linen should be fresh, immaculate, and smooth. Frequent changes are desirable. Wrinkles in sheets or in nightgown or pajamas may cause abrasions of the skin. The pillows should be freshened from time to time during the day to give comfort and ease to the head and shoulders. If a hot-water bag or ice bag is used, care should be taken to see that there are no leaks, and in the case of hot-water bags or electric pads that they are properly wrapped and padded to avoid burns. This is particularly important should the patient be unconscious. During a serious illness it is desirable not to have the patient sit up without the doctor's consent, for fear that the muscular effort may cause damage to the heart. If the patient must be moved, roll him to one side.

**289. Disposal of body discharges.** The proper disposal of discharges from the body is of the greatest importance in preventing the spread of disease. For this purpose disinfectants as prescribed by the attending physician should be used. For discharges from the nose, throat, eyes, and ears, small pieces of clean cloth, absorbent cotton, or gauze should be used and subsequently burned. A fresh supply of clean cloths should always be on hand. A paper bag pinned to the side of the bed is useful for collecting soiled gauze or cotton.

Dishes should be washed and boiled separately from those used by the rest of the family. Remnants from the meal should be burned. The door knobs of the sick room should be covered with gauze moistened with antiseptic solution, and this gauze should be changed daily.

**290. Care of hands, hair, scalp, etc.** The care of hands, hair, scalp, finger nails, and ears are important items in the treatment of disease and add to the general comfort of the patient.

**291. Oral hygiene (care of the mouth).** Cleanliness of the mouth and teeth through the use of the toothbrush and a mouth wash is one of the most important items in the care

of the sick person and should be attended to before and after meals. In the event that the person is very ill the cleaning of the mouth and teeth should be done less frequently, but never neglected. Upon the cleanliness of the mouth depends very frequently the appetite of the patient, and since food is one of the essential items in the treatment of disease this phase of personal hygiene should never be overlooked.

**292. Bathing.** Since the skin aids in regulating body temperature, attention should be paid to bathing the patient at regular intervals. Bathing cleans the skin, opens the pores, gets rid of perspiration, refreshes the patient, and stimulates the circulation. It also gives an opportunity to move the patient and relieve pressure on certain parts of the body, particularly the bony parts. This in itself helps to prevent bed sores. There are several types of bath that a patient may be given: hot, warm, and cold baths, tub and sponge baths, hot and cold packs, and mustard foot bath. Each has its advantage. The type of bath to be given depends upon the nature of the disease and the condition and temperature of the patient. The nature of the bath should be prescribed for the individual need of the patient by the attending physician. In giving a bath in bed, there are several important points to remember. The temperature of the room should be at least 70° F. Drafts should be excluded. The patient should never be chilled and never tired to the point of fatigue. The bedding should not be permitted to get wet. In preparing to give a bath the attendant should see that all the items necessary for the bath are at hand.

**293. Feeding the sick.** The problem of what to feed the sick person should be solved by the attending physician, upon whom rests the responsibility of selecting the proper food for the particular illness. The meals should be carefully planned and perfectly served. Time and thought should be given to the preparation of the tray and the selection of tray cloth and

china. Special attention should be given to the method of feeding the patient. Much comfort will be derived from the use of a bed stand when feeding. A back rest is helpful also.

**294. The sick-room conversation.** Sick-room conversations should be of a nature not to depress the patient nor to alarm him in any way. Cheer and hopefulness for a quick recovery should permeate the air. Visitors should not be admitted during the acute stages of the illness, and when the physician does permit them the attendant should limit their stay so as not to fatigue the patient. In the event that the disease is of a contagious nature, all visitors should be prohibited from entering the home. During the course of the illness members of the family should be quarantined in the home until the patient has been discharged by the physician and the rules and regulations of the local department of health complied with.

**295. Cleaning of the sick room and disinfection of toys.** When the patient is fully recovered and the quarantine has been lifted, attention should be given to the cleaning of the room and the disinfection of such articles as are to be used again. No toy should leave the sick room in a condition to carry infection. Things of trifling value and those whose value has been exhausted should be burned. Metal toys and similar articles may be sterilized by boiling. The bed, floors, walls, and all other parts of the room should be washed and scrubbed thoroughly with soap and water. In the event of serious illness of a highly communicable nature, the room should be redecorated with fresh paint. Wall paper should be removed. After the room has been thoroughly scrubbed, the windows should be opened wide and fresh air and sunshine admitted uninterruptedly for a period of twelve hours or more.

**296. Convalescence.** One of the most important periods in the treatment of the sick is the time when the fever has subsided and the disease has apparently been controlled. This is known as the convalescent period. It varies with each dis-

ease; after some diseases it is short, after others long periods of rest are required. In the case of measles the convalescent period is short; in diseases such as diphtheria, pneumonia, and influenza the convalescent period is fairly long. The toxins of these diseases have a more debilitating effect on the cells, tissues, and organs of the body than the poisons of other diseases. In many instances it is necessary to rest at least six weeks to recover completely from these enervating diseases. One may convalesce at home; but a short vacation in the country or other place where a change of scene and air will be beneficial is advisable.

**297. Amusement for convalescing children.** Recreation in the form of diverting amusement should be supplied to children convalescing from illness. These amusements may be in the form of picture books, storybooks, balls, tricks, puzzles, and a host of games that are for sale in the various shops and stores in one's neighborhood. The nature of the amusement will depend upon the age of the child.

**298. Home medication and treatment.** Dangers of self-medication should be borne in mind when one treats a symptom; for example, a headache. The relief obtained is no reason for believing that the underlying cause has been removed. Headache is mentioned as a typical example, since more people suffer from this one symptom than from all other symptoms combined.

It should be borne in mind that most drugs have more than one effect; so that if the drug is taken to relieve a symptom in one organ, that same drug may have a secondary effect upon other organs in the body. Such drugs as antipyrine, acetanalide, and similar coal-tar derivatives, which make up practically all the headache powders on the market, have secondary effects on the heart muscles and, in many instances where idiosyncrasies exist, on the kidneys as well. Grave danger exists in the taking of advertised remedies, the composition


FIG. 113. Children seem to recover from an illness more quickly if they are provided with wholesome recreation

of which is known only to the manufacturers. There is nothing new or mysterious about any advertised or patented medicine. Self-medication frequently leads to drug habits. For this reason the government has found it necessary within the last few years to prohibit the sale of certain habit-forming drugs without a prescription from a licensed physician.

**299. Administering medicine in the home.** It is assumed that when medicinal agents are taken by members of the family the suggestion has come from a physician. To be effective, medicines must be taken on time and at regular intervals. The dose must be accurately measured. Before administering medication the label on the box or bottle should be read carefully. Never use medicine from a box or bottle without a label. Never select a bottle of medicine in the dark, nor judge its contents by the shape of the bottle or by the odor or color of the contents. Avoid mistakes by being careful. The household medicine chest should contain only those remedies which are used either every day or from time to time, or else are kept for emergency purposes: it should never be stocked with medicines or drugs that have been used in a previous illness.

First-Aid Equipment for Home Nursing

Clinical thermometer
Bath thermometer
Absorbent cotton
1-inch and 2-inch gauze roller bandages
5 yards adhesive plaster, 1 inch wide
Wooden applicators
Thumb forceps
Scissors
Basins
Bedpan
Douche, or irrigating can, one-quart size
Hot-water bag or electric pad
Ice bag
Safety pins
Croup kettle
Atomizer
Rubber sheeting
Medicine droppers
Feeding cup
Feeding tube
Eye cup
Bed back rest
Feeding-tray stand
Boric acid (powder)
Bicarbonate of soda
Mercurochrome, 2 per cent solution
Alcohol (massage)
Aromatic spirits of ammonia
Vaseline
Boric-acid ointment
Can of mustard (powder)
Liquid albolene
Mouth wash
Simple laxative

**300. Fever.** The normal temperature of the body is 98.6° F. by the mouth and 99° F. if taken by the rectum. Infants and

children should always have their temperature taken by the rectum. The temperature of the body is always elevated at the onset and during the course of an illness. When the disease has been checked, the temperature returns to normal. Many diseases have characteristic fever curves. In pneumonia, typhoid fever, otitis media (abscess of the middle ear), pyelitis (pus in the kidney), and malaria one can frequently tell the nature of the illness by inspecting the fever chart. An accurate record of the patient's temperature aids diagnosis.

Temperature should be taken by means of a clinical mercurial thermometer. There are two kinds: one to be used in the mouth, the other in the rectum. Clinical thermometers should always be thoroughly cleaned with alcohol before and after using. One should be careful also to shake down the mercury in the thermometer below the point indicating 98.6° F. before taking the temperature. An arrow or red line on the thermometer usually indicates this point. The thermometer should be left in the mouth or in the rectum for a minute or two, depending upon the degree of sensitiveness of the individual thermometer. Some will register at the end of one minute; others, at the expiration of two minutes. Most thermometers are so marked. To one inexperienced in reading a clinical thermometer the utmost care should be taken to read it correctly. Mistakes may cause undue worry and alarm. A little practice will make one proficient in reading a clinical thermometer. *Cold* water should be used to wash the thermometer after use. If the thermometer is washed with hot water, the mercury will expand beyond the limits of the thermometer, causing it to break. Thermometers are very easily broken, and care should be used in handling them. If the thermometer is to be used several times a day (usually every four hours when the patient is awake) for several days, it should be kept in a small glass containing alcohol, with absorbent cotton at the bottom of the glass to prevent breakage.

**301. Pulse.** An increased pulse rate and an altered quality of the beat are also indications of illness. The pulse is best taken on the radial (thumb) side of the wrist. It is a register of the heartbeat. The index finger should be used to count the pulse rate. The pulse rate varies according to age, being greater in infants and children than in adults.

| Age | Pulse Rate per Minute |
|---|---|
| At birth | 130 to 150 |
| First month | 120 to 140 |
| Up to first year | About 120 |
| Up to two years | 110 to 120 |
| From two to four years | 90 to 110 |
| From six to ten years | 90 to 100 |
| From ten to fourteen years | 80 to 90 |
| Adults | 76 |

**302. Respiration.** The rate of respiration per minute varies according to the age and state of health. In normal health the rate of respiration for infants, children, and adults is as follows:

| Age | Respiration per Minute |
|---|---|
| Newborn | 30 to 50 |
| Up to first year | 25 to 35 |
| From one to two years | About 28 |
| From three to four years | About 25 |
| From four to fifteen years | 20 to 25 |
| Adult life | 16 to 18 |

In normal health the number of respirations per minute bears a relation to the number of heartbeats, or pulse rate, of approximately 1 to 4; during illness the respiration and pulse rates are often increased. In pneumonia, for example, the ratio is disturbed, and during sleep or rest is changed to 1 to 3. This disturbance in the respiration-pulse (R-P) ratio is one of the characteristic symptoms of the disease.

**303. Duties of parents in relation to communicable diseases.** The head of every family is required by law to report immediately to the local department of health the occurrence of a communicable disease in his home. Parents should comply strictly with the requirement of the law, not because failure to comply with the law is a punishable offense, but because it is their duty as citizens to act for the good of the community. In the event that there is a physician in attendance, it becomes his duty to report disease. In many localities a placard is posted on the door of a house telling the nature of the illness within and advising against entering, for fear of contracting the disease and spreading it to others.

### *For Informal Discussion in Class and at Home*

**1.** If you needed a nurse at home, how would you engage one? What is a mother's helper? a practical nurse? a trained nurse? a registered nurse?

**2.** If you had to consult a physician, how could you be reasonably sure that he was competent to treat you?

**3.** Have you ever visited anyone in a hospital? What did you observe? What resolutions did you make?

**4.** What are the advantages for and against hospital care versus home care for the sick?

**5.** What are the important steps in preparing a sick room?

**6.** State the important items in the general care of a patient.

**7.** How are the well members of a family affected through illness? Explain what is meant by "isolation"; by "quarantine."

**8.** Why is it important to know the common symptoms of illness and their significance? What bearing has this knowledge on such a disease as measles? as whooping cough? as diphtheria?

**9.** What are the duties of every citizen in relation to communicable diseases? Should there be any objection to having a board-of-health placard on one's door?

## CHAPTER XXII

### WORK FOR SAFETY AND BE PREPARED FOR EMERGENCIES

# In Memoriam

The Commonwealth of Massachusetts mourns the passing of the following citizens reported during the week ending Feb. 25, 1927, as having lost their lives in AUTOMOBILE ACCIDENTS:

| | | | |
|---|---|---|---|
| Charles Smith . . . | aged 74, | Palmer . . . . . | pedestrian |
| James Harris . . . | aged 50, | Westfield . . . . | pedestrian |
| Harry Day . . . . | aged 47, | Hyannis . . . . | occupant |
| Will Jones . . . . | aged 45, | Hyannis . . . . | occupant |
| Polly Black . . . . | aged 45, | Watertown . . . | pedestrian |
| Milton Turner . . | aged 30, | Malden . . . . . | pedestrian |
| Kate Bates . . . . | aged 20, | Northboro . . . | occupant |
| Ralph Hollister . . | aged 15, | Dartmouth . . . | occupant |
| Paul O'Meara . . . | aged 12, | Leominster . . . | occupant |
| Mary O'Toole . . | aged 7, | Webster . . . . | pedestrian |

DRIVERS PLEASE REMEMBER

DRIVING CONDITIONS ARE VERY BAD — STREETS ARE WET AND SLIPPERY YOU CANNOT STOP AS QUICKLY AS ON DRY ROADS

PEDESTRIANS PLEASE REMEMBER

THE MAN IN THE CAR HAS LESS CONTROL ON WET STREETS. YOU SHOULD EXERCISE MORE CARE WHEN DRIVING CONDITIONS ARE BAD

EVERYBODY PLEASE BE CAREFUL

The readers of Massachusetts newspapers were very much shocked one morning to read the news presented above. In the course of a single week ten people had lost their lives. With the exception of perhaps one individual they were at an

age when they might be expected to give many years of service as citizens of the state. The loss of life from automobile accidents in a state like Massachusetts is large for one week; but if the victims for one year could be piled one on top of the other, there would be a ghastly pile towering as high as the

Underwood & Underwood

FIG. 114. Schoolboy traffic officer

Los Angeles solves the traffic problem for school children by appointing students as traffic policemen

lofty Bunker Hill Monument. What the total would be for the nation must be left to the imagination. Yet automobile accidents and all other accidents are usually preventable if people would only use special effort to be careful at all times. Many lives would also be saved if people only knew the best thing to do in case of an emergency.

**304. Accident prevention on public highways.** Accidents on the public highways are among the chief causes of accidental

*A*

*B*

*C*

FIG. 115. Good eyesight prevents accidents

Notice the difference between a busy thoroughfare as seen by a person with (*A*) good eyesight, (*B*) medium degree of nearsightedness, and (*C*) astigmatism. Some cities grant licenses to drive an automobile only to those who have naturally normal vision or wear glasses which correct defects. (By courtesy of the Eye Sight Conservation Council)

death. With the still rapidly increasing number of automobiles, accidents on the public highways are likely to continue to increase unless drivers and pedestrians will exercise greater care in avoiding accident. Today the ordinary well-traveled thoroughfare is as dangerous as a railroad track, if not more so.

Those who drive automobiles need to know the rules and regulations governing traffic. They should obey the speed laws. They also need to watch the official lights and signals.

The pedestrian should be careful about crossing the street. Cross at the crossings. Follow the directions of the traffic police. Whether or not there is a traffic officer on guard, it is well to look up and down the street before crossing. If we find it necessary to walk along a public highway, it is better to walk on the left side of the street, against the traffic. This minimizes the risk of being struck from behind.

Many accidents occur in getting on and off vehicles. The best advice is "Wait until the vehicle comes to a complete stop."

Railroad tracks are always dangerous. Avoid them. If you must cross them in driving or on foot, "stop, look both ways, and listen."

Hitching on to moving wagons, automobiles, and street cars is a dangerous practice. Children who do this are often hurt or killed from falling and being run over by a vehicle coming from behind.

Children should never play in streets where traffic dangers exist. Use "play streets," athletic and recreation centers, parks, and sidewalks. Coasting, bicycling, and roller skating on public thoroughfares are usually forbidden.

Sidewalks are sometimes dangerous. When they are ice-covered use your rubbers and watch your step. Serious sprains and broken bones occur every winter as a result of falling on slippery walks. Banana skins and boards with projecting nails should always be removed. If the boards are not disposed of, projecting nails wherever found should be removed promptly.

Strange animals are always to be avoided. Sometimes they bite, or they may carry disease. Dogs outside of their own premises should ordinarily be muzzled or leashed.

**305. Accident prevention in schools and workshops.** There are many ways in which pupils in school may do something for the safety of themselves and others. In moving about the corridors of school buildings it is always wise to keep to the right. Pushing, especially in going up and down stairs, causes a number of serious accidents every year. Every pupil should become thoroughly familiar with fire signals and exits. The escape of illuminating gas or irregularities in connection with the electricity should be reported promptly to the teacher, principal, or janitor. Laboratories, especially chemical laboratories, may offer danger to pupils who are careless. Avoid explosives and fumes. Use extreme care in the handling of acids and strong alkalies. Take no chances. Think of what you are doing. When at work in machine shops make use of safety devices — guards, masks, and eye protectors. Here, also, it is wise to take no chances. In games, athletics, and the use of gymnasium apparatus avoid dangerous stunts. It is not an evidence of courage but of foolhardiness to attempt to do things that involve great risks.

**306. Accident prevention at home.** The automobile is responsible for many accidents and deaths, yet most people are surprised to hear that there are as many lives lost in our homes as in automobile accidents. There are nearly as many lives lost in accidents in the home as are lost in all our industries combined. Nonfatal injuries are also much more common in the home than on the street. The reason why we do not hear so much about accidents in the home is because they are not so spectacular and do not make such good copy for the newspapers. A Mr. Alexander spent several months in traveling round the world. He faced many dangers, but was not ill and was in no accident. If he had been in a head-on

collision on his arrival in New York, it would have been one of the sensations of the hour; yet when through carelessness he stepped on a rickety stepladder in hanging a picture and sustained internal injuries which later proved fatal, few people knew about it. It is evident that for children and adults the avoidance of home accidents requires the same sort of personal carefulness which is necessary on the street and in the factory.

FIG. 116. What rule of safety is or has been violated?

It is never safe to leave little children alone. Not only is there danger from fire but also from various accidents and mishaps. In the case of young children all household articles that are dangerous should be put in a safe place. Among these articles are knives, scissors, needles, nails, curling irons, pins, and stearate of zinc powder.

Many accidents are caused by people's taking medicine, home remedies, and poisons by mistake. It is a good plan not to save medicines. Read medicine labels twice before using once.

Inflammable and explosive materials such as matches, benzine, gasoline, and firearms cause many accidents. Matches should be kept in an earthen or metal container. Benzine and gasoline should be kept in safety containers far away from the fire. Do not get near a light or fire when you are using them.

Nearly every paper heralds some calamity resulting from the use of gas or electricity. Gas leaks should be reported immediately to a plumber or to officials of the gas company. Do not under any circumstances try to find a leak in the gas pipes with a match. Inspect the pilot light of hot-water heaters at frequent intervals.

Anything wet is a good conductor of an electric current. Remember not to touch or turn on an electric current with wet hands while you are taking a bath or standing in a pool of water or when you have on a wet bathing suit, wet shoes, or damp clothing. Never touch metal with one hand and turn on an electric current with the other.

There is great danger from asphyxiation by carbon monoxide. This is a deadly gas because it unites readily with the red corpuscles of the blood and prevents them from carrying a sufficient supply of oxygen to the tissues. Carbon monoxide is the result of incomplete combustion. The exhaust from an automobile contaminates the air with carbon monoxide. For this reason an automobile engine should never be run in a closed garage. Have windows and doors open. Furnaces and coal burners are also a menace if drafts are not kept open and good ventilation provided. In a case reported recently, on a cold winter's night a family of six sat round a coal stove which did not have its drafts properly adjusted. The windows and doors were closed tight. The next morning the entire family was found dead. Strangely enough, a dog lying on the floor was revived. His escape was due to the fact that the small amount of fresh air that got into the room was cold, consequently heavy, and fell to the floor.

Falls are one of the common causes of injuries. Inspect all chairs and ladders before using. Avoid all unsteady supports. See that stairs are always free of things which might make one stumble and fall.

**307. Accident prevention on vacations and during recreation.** In having a good time there are certain things to be considered in the way of safety. On picnics, for example, do not drink from strange wells and pools. Take your drinking water with you if you are not certain about the water supply.

It is really unwise, considering your comfort and health, to make any kind of commotion near beehives.

Let poison ivy alone.

In taking long hikes take proper precautions to avoid blisters.

Wear proper shoes.

Take rest periods to avoid heat prostration.

Shade your head to prevent sunburn.

Swimming is healthful and good fun under proper conditions, but avoid scum-covered ponds. Beware of suction holes.

Even in the coldest weather ice-skating may be dangerous. Observe the danger signals. Look for the "red ball" sign.

Since lightning often strikes trees, avoid taking shelter under them during rainstorms and showers.

When you go to a theater or an assembly hall select the nearest fire exit on entering.

Avoid eating food that is exposed to dust or is handled by venders.

To be safe on a vacation is to be happier.

**308. Until the doctor comes.** To be of help in case of an emergency one needs to know exactly what to do. The following general rules will prove helpful:

Do not become unduly excited or alarmed.

Be quick and quiet.

Do the most necessary thing first.

Always have on hand the name and telephone number of a neighboring physician known to members of your household and the name and telephone number of your private physician. This applies also to your neighborhood druggist, local police station, fire-engine house or fire-alarm box, and nearest hospital (ambulance call).

Request a reliable person to telephone for a doctor or to bring one; in the interim take charge of the case yourself and get someone to assist you.

Make the patient comfortable by laying him down. Loosen his clothing. Remove clothing from the injured part first. If cutting is necessary, open a seam if possible.

In case of poisoning, the nature of which is unknown, empty the stomach by having the patient vomit; then give large quantities of milk or whites of eggs in water.

Have on hand (particularly in the household) a sterile gauze roller bandage, sterile absorbent cotton, and an antiseptic for local application, such as tincture of iodine or a 2 per cent solution of mercurochrome.

**309. Unconsciousness.** There is no reason for immediate alarm. Try to determine the cause so as to know better what to do. The chief causes of unconsciousness and a brief discussion of treatment follow:

*Fainting.* Fainting may be due to a variety of causes, such as an emotional disturbance or physical strain. The face is pale and bloodless and the pulse weak. First, lay the patient flat on the back, with the head lower than the rest of the body. This allows the blood by force of gravity to flow toward the head. Loosen tight clothing, keep the crowd away, and give plenty of fresh air. Sprinkle cold water on the face. Rub the limbs toward the trunk. Apply the fumes of smelling salts or household ammonia (on absorbent cotton) to the nostrils. Be careful not to cause a burn. When the patient regains consciousness, allow him to rest in a recumbent position.

*Sunstroke*, or being overcome by heat. The symptoms of sunstroke are hot head, red face, skin hot and dry. The breathing is labored and gasping. Try at once to reduce the temperature. Lay the patient in a cool, shady spot, loosen tight clothing, and pour cold water over the head and chest. Rub the exposed parts of the body vigorously with ice.

*Electric shock*. Shock sometimes brings sudden loss of consciousness. The breathing may be entirely stopped, the pulse be weak, and there may be burns on parts of the body in contact with live wires. First shut off the current. Do not touch the person until this is done if you would escape a shock yourself. If you cannot shut off the current wear rubber gloves and boots to make the rescue, since rubber is a nonconductor of electricity. Use artificial respiration until the doctor arrives. Send to the local gas company for a pulmotor. Prompt and long-continued treatment of this kind is important.

*Lightning stroke*. Lightning stroke is rather uncommon. Administer strong black coffee. Use artificial respiration if necessary. Let the patient rest.

*Alcohol poisoning*. Alcohol poisoning may be revealed by unconsciousness and the telltale breath. Give the patient strong black coffee and arouse him if possible with cold splashes on the face. Put him to bed and keep him quiet.

**310. Cuts and bleeding from wounds.** In most cases bleeding will stop if the injured part is elevated and pressure applied directly on the wound. Guard against infection. Wash your hands carefully. If bleeding is profuse and is not easily controlled, use a tourniquet. With a cotton swab apply tincture of iodine or a 2 per cent solution of mercurochrome. Apply to the wound and surrounding skin. Cover the wound with dry, sterile dressing. A compress serves two purposes: it protects the wound from secondary infection and checks further bleeding. Hold the compress in place with adhesive plaster. The outside gauze dressing should be changed when

soiled, without disturbing the compress directly in contact with the wound. Avoid dressing the wound too often. Never apply collodion or "new skin" directly to the wound.

**311. Nosebleed.** Nosebleed comes on spontaneously and is usually due to an abrasion of the mucous membrane lining the septum, or partition of the nose, about half an inch from the opening of the nostrils.

Have the patient sit erect, with head back. Loosen the collar and tight clothing round the neck. Place cold compresses over the nose. Insert absorbent cotton under the lip and apply pressure by means of the fingers. Insert a small piece of sterile absorbent cotton moistened with hydrogen peroxide into the nostrils for a distance of about an inch. A wooden applicator or clean toothpick will help to insert the cotton. By means of the fingers apply pressure toward the center of the nose. The patient should be kept quiet for several hours after the bleeding has been controlled.

**312. Sprains.** Twisting, stretching, or tearing of the tissues round a joint is called a sprain. It may result from strenuous physical exercise or from a misstep. There should be absolute rest to prevent further damage. Do not move the joint or permit the patient to use it. Elevate the joint and apply hot and cold compresses for about half an hour. Apply light supporting bandages until the doctor arrives.

**313. Skin bruises.** In accidents the skin may be torn, painful, and swollen. One of the common signs of a bruise is a black-and-blue mark. In treating apply a 2 per cent solution of mercurochrome by means of sterile absorbent cotton. Cover the part with a sterile gauze compress and hold it in place with a bandage.

If the wound has been caused by a rusty nail thrust in deeply, or inflicted by gunpowder (as from fireworks), the physician should be informed so as to bring with him tetanus antitoxin, to prevent lockjaw.

**314. Burns and scalds.** If the clothing is on fire, place the patient on the floor or ground and smother the flames with a coat, rug, or other heavy fabric. If none of these are available, have the victim roll on the floor. Protect the face at any cost.

Dry heat, such as heat from the sun or a hot stove, produces burns; moist heat, as in the case of steam, leads to scalds. Shock often follows extensive destruction of the skin. This is due, first, to the severe pain and, secondly, to the sudden strain on the kidneys and adrenal glands. Burns vary in degree, depending upon the depth, extent, and part injured as well as upon the age of the injured person. Children and the aged suffer most. The following suggestions are offered for treatment:

Exclude air by applying a thin layer of boric-acid ointment or sterile vaseline. Cover with sterile gauze and apply a light bandage. Keep the part at rest. Further treatment should be given by a physician.

For acid burns, wash off the acid with a solution of water and baking soda. In this case a paste of baking soda (bicarbonate of soda) and water is best, because the soda, being an alkali, neutralizes the acid.

If an acid solution has been swallowed, give limewater or milk.

In case of burns from alkalies, wash the parts with lemon juice or with vinegar and water.

For lime burns of the eye use liquid albolene or olive oil.

**315. Poisons.** In most cases of poisoning the important thing is to empty the stomach and bowels of the victim and give an antidote for the particular poison that has been swallowed. There are two kinds of poisons: irritants and narcotics. Irritants will corrode and burn the skin and flesh, giving rise to such symptoms as burning pain in the mouth, throat, and abdomen. In the case of poisoning with narcotics, symptoms come on very slowly. Fifteen or twenty minutes

will elapse without any apparent effect. Then the victim begins to get drowsy, and lapses into a stupor. For treatment:

Cause vomiting as quickly as possible, to remove the poison. To do this, have the patient swallow mustard water, sirup of ipecac, or large quantities of lukewarm water; then thrust the finger down the throat. In case of coma, or unconsciousness, prop the mouth open by inserting a cork or other instrument. After vomiting, give milk and white of egg, or flour and water.

In the case of poisoning from narcotics or other poisons that produce heavy stupor, give black coffee after emptying the stomach and make every effort to keep the patient awake. If he is in collapse or shock, keep him warm and perform artificial respiration.

**316. Poison ivy.** Immediately after contact with the leaves of the plant wash the skin several times with soap and water, then wash thoroughly with undiluted alcohol. Finally rinse off with clear water. (See section 275.)

**317. Bites.** In case of *snake bite* encircle the limb with a bandage between the bite and the body. This must be made tight enough to shut off the flow of blood to the body and prevent the absorption of the poison. Cauterize the wound with pure fuming nitric acid, washing off the excess with warm water. Follow with an application of alcohol. Then remove the tight bandage. The drinking of alcoholic liquor for snake bite is not recommended by reputable physicians today. In case of rattlesnake bites a serum called crotalus antitoxin will be used.

For *dog* and *cat bites* proceed as with snake bites and cauterize. Whenever possible hold the animal for further observation and examination for hydrophobia, or rabies, by the local department of health.

*Bee stings* and *bites of insects* should be treated with ammonia water applied directly to the wound by means of gauze.

*Frostbites* of the ears, feet, and hands are likely to occur during cold winter weather. The frozen parts are blue and purple and at first painful. Later they become blanched and without pain. When this stage is reached, the nerves of the parts frozen have lost their power of sensation.

To treat frostbite, rub the frostbitten parts gently with snow or bathe with ice-cold water until a tingling sensation results. This indicates the return of the circulation. Never permit the patient to go near the fire or apply heat until feeling

FIG. 117. Lay the patient on his abdomen; extend one arm directly forward; bend the other arm at the elbow; rest side of face on the hand or forearm, so that the nose and mouth are free for breathing

and normal color have been restored to the afflicted part. Sudden applications of warmth may cause gangrene to set in subsequently.

**318. Suffocation.** Unconsciousness in the case of suffocation is due to the cutting off of the air supply. This may be due to foreign bodies in the windpipe, diphtheritic croup, smoke from fire, or drowning. The person thus suffering is likely to have a purple and bloated face and blue lips. He gasps for air.

In treatment try first to remove the cause of suffocation. In cases of suffocation by gas remove the patient to fresh air. Rescuers should use gas masks or should protect the nose and

mouth with a damp cloth. Use hand flash lights. Do not light matches. Open the windows. In mild cases of suffocation by gas stimulate with aromatic spirits of ammonia given by mouth or with ammonia water applied on absorbent cotton to the nostrils. If the patient is completely unconscious use

FIG. 118. Place yourself astride of the patient's body in a kneeling position, facing his head. Bend your body slightly forward so that the weight of your shoulders can be brought into play

artificial respiration until a pulmotor arrives. The method of using artificial respiration in cases of persons apparently drowned or overcome by gas or shocked by electricity is shown in Figs. 117 to 121.[1]

**319. Convulsions (epilepsy, or fits).** Lay the patient down where he will not injure himself. Protect the tongue from being bitten by inserting something between the teeth, such

[1] Photographs by courtesy of Metropolitan Life Insurance Co.

as a handkerchief rolled on a spoon handle, a lead pencil, or a cork. If children have convulsions, give an enema of soap and water to empty the bowels. Place the patient in warm water to which powdered mustard has been added. Apply cold cloths to the head.

**320. Croup.** There is a spasmodic cough in croup. For relief of the nondiphtheritic type, place a mustard plaster over the breastbone, including the throat. Make a plaster with one part of mustard, two parts of flour, and enough warm water to make a smooth paste. Place between two layers of muslin or old linen. Fold the sides in to prevent oozing. Rub vaseline on the skin before applying the plaster. Leave the plaster in place for half an hour and remove. Protect the reddened area of the skin with the nightdress. Inhalations of steam from hot water to which tincture of benzoin is added (a teaspoonful to a pint of hot water) is also beneficial. Relief may be thus secured.

FIG. 119. Place your hands flat over the small of the patient's back with the fingers spread out on each side of the body over the ribs

**321. Drowning.** America has become a great vacation land. Every summer thousands of people leave the city and turn to the enjoyment of country life. Spending week-ends at the mountains, the seashore, and rural places has also become popular. Among the chief amusements of those seeking recreation is swimming and other water sports. Every year many people lose their lives on the water largely because they cannot swim or because they are careless. Death rates from drowning are in a class with the mortality from typhoid, and deaths from both causes are almost entirely preventable. Everybody should

FIG. 120. With arms held straight, lean steadily forward, allowing the weight of your body to produce a firm but not violent pressure upon the patient. This act should take from two to three seconds

FIG. 121. Sway your body thus backward and forward upon your knees (releasing your hands suddenly as you sway backward) twelve or fifteen times a minute with rhythmic movements. Continue artificial respiration until the patient breathes again

learn to swim, and everybody should know what to do in case of drowning. The following suggestions are worth knowing:

Act quickly; every second counts.

Lift the patient so that his head and shoulders hang down, thus allowing any water to flow out.

Remove obstructions from the mouth and throat (grass or artificial teeth).

Loosen clothing from the neck and chest.

Then place the patient on the ground, face downward, with a coat or sweater rolled up under the middle of the body.

Turn the head to one side and rest it on the forearm so that the mouth and nose will not touch the ground or arm.

Keep the patient warm.

Start artificial respiration (by Schäfer method) at once as follows:

Place yourself astride of the patient's body in a kneeling position, facing his head.

Place your hands flat over the small of his back, with the fingers spread out on each side of the body over the ribs.

Lean steadily forward, allowing the weight of your body to produce a firm but not violent pressure upon the patient.

Sway your body thus backward and forward upon your knees (releasing your hands suddenly as you sway backward) twelve or fifteen times a minute with rhythmic movements.

Be careful not to use too great pressure.

Continue artificial respiration until the patient breathes.

The United States Life Saving Service advises artificial respiration to be continued for four hours if necessary. The fumes of ammonia water on a sponge or handkerchief should be applied to the nostrils by an assistant. When the patient revives, keep him lying down until he is fully conscious.

**322. Breaking through the ice.** It is always dangerous to try to rescue anybody who has broken through the ice. If you are called upon to do this, remember these things:

Do not walk out to the drowning person.

Approach by distributing the weight by creeping on the stomach.

Use a pole or a plank.

Throw a rope or use a belt.

Apply warmth and induce artificial respiration after the rescue, if necessary.

**323. Fractures.** Broken bones or fractures may be either simple or compound. In the former case the bone is broken, but the skin is not injured. In compound fractures the ends of the bones are broken through the skin and exposed to the air. This type is more serious than the former because infection may set in.

A simple fracture may be difficult to discover. Usually when the bone is broken, there is severe pain at the point of injury and loss of function. The skin is discolored owing to the escape of blood. The limb is likely to be altered in shape and the injured part is swollen.

In the treatment of fractures remember to avoid, as far as possible, moving the limb, but do not leave it hanging down.

Elevate it at once, using both hands to support it evenly at either side of the place where the break is.

Keep the limb absolutely rigid, because a compound fracture may result from permitting the ends of the broken bones to pierce through the skin.

Use a pillow while splinting the injured limb.

Use splints of cardboard or wood, a little longer than the injured bone, to prevent motion. Pad well with absorbent cotton and hold in place with a roll of bandage or adhesive plaster. A large handkerchief, napkin, or bed sheet may be used as a triangular bandage (sling) for injuries of the arm and collar bone.

**324. Foreign bodies in the throat.** In the case of a fishbone, try to locate it. Remove with your fingers. If it lodges in

the throat, and the patient is choking, slap him vigorously on the back. If the victim is a small child, seize him by the legs, holding him upside down, while someone else slaps his back. Place your finger down the throat, thereby causing the patient to vomit and at the same time to expel the obstruction. This action frequently proves a life-saver.

**325. Foreign bodies in the eye.** The foreign body is usually a cinder or some tiny bit of metal. It may be removed by simply taking hold of the eyelashes of the upper lid and drawing down toward the lower lid. While this is being done the patient should blink. If this is not successful in removing the annoyance, wash out the eye with boric acid solution, employing an eyecup. If this is not successful, and the foreign body is under the lower eyelid, draw that member down with the index finger of one hand, locate the foreign body, and, with the corner of a clean handkerchief, remove the body with the other hand. If it is under the upper eyelid, invert that member by means of a match-stick and proceed as in the case of the lower lid. To invert a lid, press the match-stick backward and roll the eyelashes up over it. After the foreign body is removed, wash out the eye with boric acid solution (a teaspoonful of boric acid powder to a glassful of warm boiled water).

**326. Senior high-school students work for safety.** In the spring of 1924 John R. Fausey, Superintendent of Schools at West Springfield, Massachusetts, asked the senior English class of the high school to coöperate with him in a town-safety campaign. The class met and decided to concentrate their efforts upon publicity work in the interests of the safety of the younger children.

Letters were sent to different parts of the country for printed matter on accident prevention and safety. Posters were sent to the art department, which used many of the designs and slogans in its work with the lower grades. The

West Springfield High School,
April 8, 1924

To the Boys and Girls of the
West Springfield Schools:

Our Superintendent, Mr. John R. Fausey, has asked our English Class 12 C to help out on the Safety Campaign. Our Class has decided to send weekly bulletins to all the schools offering suggestions which we hope will be helpful.

Today we are sending you the following slogans:

Make Safety First your middle name.

He who learns to look each way
Will live to look another day.

Chance travels on crutches.

Jack be nimble, Jack be quick,
But don't run round with a pointed stick.

Goosey, goosey, gander, why do you wander
Off the curb, off the curb, always into danger?

Perhaps you can think of some other motto or jingle, and you might make pictures to illustrate them.

This week we are also sending you ten safety rules for children, printed on cards and kindly given us by the Automobile Association of Springfield. If you obey these rules you will be safer.

Before long some of our boys and girls are going to make you a little visit and talk to you personally.

Good-by until next week.

Yours for a long and safe life,
English Class 12 C

literature was distributed to members of the class for study. Reports were made in the recitation period. The class finally decided to send a weekly bulletin on safety to the grades. Two students were appointed by the class president each week to prepare these bulletins, which were read and corrected in class. The corrected papers were sent to the printing department of the school. Later mimeographed copies were distributed. The first letter appears on the previous page.

Other letters followed. A "flying squadron" of speakers was organized among members of the class, who visited the elementary schools. There were many other things that this alert class did to arouse enthusiasm for safety in the town.

The authors are telling this story because they hope to hear that many classes who use this book will be stimulated not only to train themselves for their own safety but to do something for safety in their school and city.

*For Informal Discussion in Class and at Home*

**1.** Write a slogan that will interest young children in their personal safety on public highways.

**2.** Assuming that you see a child on the streets conducting himself in a reckless manner, what is your duty as a junior citizen?

**3.** How would you interest a prominent citizen in your community to assist you in securing a safe place for children to play after school hours?

**4.** What precautions should your mother take to prevent injuring herself through carelessness during her next house-cleaning campaign?

**5.** Explain why clean-up days and weeks are necessary. Give the date when your cellar or attic was last cleaned.

**6.** What is a "jay walker"? What is a semaphore? How does it affect your safety on public highways?

**7.** Organize an Accident Prevention Club in your school. Make a drive for a large membership. Obtain authority from your

principal to issue summonses to children who violate safety precautions, and bring them to school court for discipline.

**8.** Ask your principal to invite a motorcycle policeman to address the school on "Safety Precautions on Public Highways."

**9.** Arrange for five-minute speeches by members of the police and fire departments on subjects pertaining to safety in the home and on the streets.

**10.** In the event of accident, how would you summon an ambulance? a fire engine? How may a pulmotor be obtained?

**11.** What is the purpose of first aid? What articles of first aid should you keep in an automobile? on a hike? in a trunk or kit bag while you are on a vacation?

**12.** Mention some of the more common emergencies. State exactly what to do for each one until the doctor comes.

**13.** Demonstrate before a group of friends the Schäfer method of resuscitating a person rescued from drowning. Obtain permission from your teacher to demonstrate the method before the students of your class.

# CHAPTER XXIII

## HEALTHY, HAPPY CHILDHOOD

**327. Infant welfare.** When we speak of increasing the span of human life, we do not mean that people reach extreme old age as compared to a generation ago, but rather that the average length of life has been increased. This increase is due in large measure to the saving of life at the beginning, rather than at the end. The average span of life has been increased because more babies are being saved today as compared to a generation ago. Preventive medicine in all its phases has been directly responsible for saving the lives of hundreds of thousands of babies who would ordinarily have died but for the practice of infant and child hygiene.

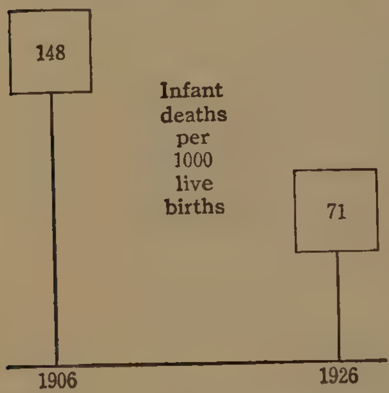



FIG. 122. Good hygiene saves the lives of infants

The graph above is the record from sixty-eight cities of the United States registration area

Many years ago our efforts were directed almost entirely to the treatment of the sick baby; today we devote our time to keeping the well baby from getting sick. With such practices the infant mortality in the large cities of this country has been reduced from 148 deaths per 1000 live births in 1906, to 71 deaths per 1000 live births in 1926. The prevention of infant mortality involves prenatal care of the mother and child, infant feeding, the health of the mother, home environment, the milk supply, and many other factors. It is quite essential

that the expectant mother should place herself under the care of a competent physician and adhere strictly to his advice.

**328. Birth registration.** Vital statistics laws generally require that every physician, within ten days after birth of a child, file a written certificate of the birth with the registrar

FIG. 123. A healthy family

For three consecutive years this family has taken the prize at the Illinois State Fair for being the healthiest family of six children. Every child in the group is under sixteen years of age

of the local department of health. The evidence afforded by a birth certificate may become necessary to prove American citizenship, to establish age for entrance to school, or to obtain working papers. The right to vote, to marry, to make contracts, to establish claims to inheritances and pensions, may depend upon the filing of a correct birth certificate. Parents should see that their children's rights are protected in this respect.

**329. Physical development of the child.** 1. *Weight.* In the healthful upbringing of infants and children it is very helpful to have some trustworthy facts which may serve as indexes of normal growth and development. The average weight of a newborn babe is seven and one-half pounds. This weight is doubled in five months and tripled in from twelve to fourteen months. It should be impressed upon the mother that this is an average, and deviations from the average should not cause undue alarm, although marked differences should put her on her guard. A weekly weighing is sufficient for the average baby for the first few months. Thereafter once a month is all that is necessary until the baby is two years of age. Unless there is some specific reason for weighing the baby more frequently, it is not necessary to do so more than three or four times a year thereafter. Growth is most rapid in the first three months of the child's first year. During this time the average weekly gain is six ounces; in the second three months, five ounces; in the last six months, three ounces. From the end of the first year the normal increase is at a slower rate, so that the weight should be about as follows:

© Pacific & Atlantic

FIG. 124. A healthy child

26 pounds when the child is two years old
31 pounds when he is three years old
35 pounds when he is four years old
41 pounds when he is five years old
45 pounds when he is six years old

2. *Height.* The rate of growth of the child in height, or length, is an important part in determining whether the nutrition, growth, and general development are what they should be. A satisfactory increase in weight alone does not necessarily indicate a normal development. An unsuitable food may increase the weight rapidly enough or even fatten the baby or child too much, while the development may be faulty and the degree of resistance against disease lowered. So a record of the increase in height, together with the increase in weight, should be made and should be used as a guide in looking after the welfare of the child. The following table shows approximately what the increase in height should be for the infant and the pre-school child:

| | |
|---|---|
| 20 inches at birth | 35 inches at three years |
| 25 inches at six months | 38 inches at four years |
| 29 inches at one year | 41 inches at five years |
| 32 inches at two years | 44 inches at six years |

**330. Fontanels.** On the top of a baby's head, just back of the forehead, there is an opening or soft space not yet filled in with bony formation. This is known as the anterior fontanel to distinguish it from the posterior fontanel, located farther back, but which closes shortly after birth. The anterior fontanel usually closes about the eighteenth month.

**331. Teeth.** The embryonic teeth begin to develop at least six months before the birth of the child. It is probable that a diet of milk, vegetables, and fruits, rich in mineral salts, and vitamins partaken of by the mother, and regular exposure to sunlight lay the foundation for the making of good teeth. Every child has two sets of teeth. The first teeth are known as the deciduous, temporary, or milk teeth, and are replaced about the sixth year with the permanent, or second, teeth. At birth the teeth are embedded in a cavity of the jawbone surrounded and covered with a soft tissue of the

gum. As the baby grows, the teeth grow also, and should get through the gums at about the sixth month of life. There are twenty milk teeth, ten in the upper jaw and ten in the lower jaw. The teeth appear in groups. By the time the baby is one year old he should have six teeth, at one and a half there should be twelve, and at two years sixteen. By the time he is two and a half years old he should have his complete set of twenty teeth. While the teeth usually appear at from six to nine months, and while a regular order of appearance is usually followed in the case of a normal child, there is wide variation both in the time and in the order of appearance, so that the mother need not be concerned if the exact order is not followed or if there is delay in appearance.

While there may be a great discomfort associated with teething, and while there may be such symptoms as increased bowel movements, vomiting, fretfulness, and fever, many of the ills charged to teething are not due to it at all. Serious illness on the part of babies has often been neglected by assuming that the disturbance is simply due to teething. Whether teething or not, the cross and sick baby should have the benefit of a doctor's care.

Soothing sirups should not be given during such periods, under the impression that the disturbance is due to difficult or delayed dentition. The teeth should receive attention as soon as they make their appearance. They should be brushed twice a day with an infant-sized toothbrush moistened with warm water. Tooth powder or paste is not necessary until the child is at least eighteen months of age. Gentle friction should be applied to the gums during the act of brushing the teeth. Children should be taken to a dentist as early as the eighteenth month, not for the purpose of reparative work but to introduce the child to the dentist and the environment of his office. On such visits the mouth and teeth should be

inspected and tartar deposits removed if present. Treatment at so early an age will eliminate the pain that may be produced if work is delayed úntil exposed nerves in carious teeth are touched. Semiannual visits to the dentist thereafter will prevent large cavities from forming. Other irregularities of the teeth and mouth can be taken care of before they are too far advanced. It is essential that cavities in the first teeth should be filled, even though the child will eventually have them replaced by permanent teeth. Early and regular attention to the primary, or milk, teeth will help to produce sound permanent teeth.

Pacifiers should be prohibited and thumb-sucking should be discouraged. Such practices are apt to lead to deformities of the mouth and nose, to malocclusions of the teeth, and to changes in facial expression.

**332. Mental development.** A normal baby smiles at about five weeks of age, recognizes objects at two months, and laughs aloud at from three to five months. He learns to hold up his head unsupported during the fourth month. He begins to show an interest in toys and to play with them from the fifth to the seventh month. At six to eight months he is usually able to sit erect; during the ninth or tenth month he makes the first attempts to stand, and can usually support himself by holding on to objects at eleven to twelve months. He begins to walk with assistance at the twelfth or thirteenth month and walks alone at the fifteenth or the sixteenth month. At one year of age a child should enunciate simple words; at two years he should connect short, simple sentences. Since children differ in the rapidity of their development, — some being slower and some faster, — a mother should not be unduly alarmed at variations from this statement. A marked difference, however, should put her on her guard.

Mental development should include more than the devel-

opment of the senses and the faculty of speech: it should include the development of right living and right thinking. Children are quick to form habits, and they are as ready to form good habits as bad if only they are trained in the right direction. An infant's mental training and discipline should begin as soon as he is born. This can be done by establishing a regular daily routine, so that the same things are done for the child at the same time each day. This is especially true of feeding, sleep, exposure to sunlight and fresh air, regularity of bowel action, and play.

**333. The nursery.** The nursery should be located in the best room in the house. If possible, there should be ample window space and a southern exposure. This is necessary because sunlight is a very important feature in the growth and development of the child. Both the furniture and furnishings of the nursery should be simple. The bed should be made of metal, in order that it can be washed from time to time. The flooring should be of such a character as to be easily washed and cleaned without creating a cloud of dust. The walls should be painted with good washable paint. All the windows and doors in the house should be screened against flies and mosquitoes during the summer months. The windows of the nursery should have dark shades to be used during daylight hours of sleeping. A wall thermometer should be placed directly over the baby's crib. During the winter months the temperature of the nursery should be between 68° and 70° F. during the wakeful hours and 55° to 60° F. at night. During inclement weather in the winter months the nursery should act as an outdoor porch for the infant or young child. He should be dressed as if he were to be taken out of doors and be placed near a window, which should be opened above and below. The door of the room should be closed, to prevent drafts. During the winter months care should be taken to prevent frostbite of the face and hands.

Except for the time spent in bathing, feeding, and dressing a baby, it is essential that he should be in contact with fresh air in motion practically all the time. During the summer a newborn baby may be taken out of doors at the end of the first week, but he should be gradually accustomed to the outdoor air. While it is not difficult to keep the temperature of

FIG. 125. The lives of thousands of babies are saved each year through the practice of infant hygiene in modern hospitals

Courtesy of Mt. Sinai Hospital, New York City

the baby's room between 68° and 70° F. in winter, it should be kept as cool as possible in summer with the aid of awnings or dark shades.

**334. The nursery maid or the mother's helper.** Great care should be exercised in the selection of a mother's helper or a nursery maid for the baby. The character of such a person should be thoroughly investigated before she is employed. An inquiry should certainly be made with reference to her health. It is not uncommon for infants and young children

to be infected with tuberculosis and venereal diseases by attendants suffering from such illnesses.

**335. Clothing.** The object of clothing is to protect the baby and to keep him comfortable. The infant quickly shows the effects of heat and cold. Too much clothing will cause discomfort and sweating; too little clothing will chill the baby, causing cold hands and feet and restlessness. One should be guided by common sense, and should not follow blindly old customs and traditions.

The clothing should be simple and loose enough to permit the arms and legs to move freely. Health and comfort should be the first consideration. The essential thing about the infant's wardrobe is that it should be plain and inexpensive: as a rule, babies and young children are overdressed. Sweaters should be reserved for outdoor use and not be worn indoors. Ordinarily there is no need for an overtight and bulky belly-band so commonly in use for the first month. It should be worn for this period only on the advice of a physician. The baby's clothing should be changed frequently. No time that is spent in keeping him clean, dry, and comfortable is wasted.

**336. Shoes.** Infants under nine months of age should not be burdened with shoes. If shoes are worn at all, they should be for the purpose of protection. After one year, when a child begins to creep, then to stand, and later to walk from chair to chair, the feet should be protected with soft-soled shoes of the moccasin type. Orthopedic shoes for older children with normal feet should be avoided. If an orthopedic defect exists a physician should be consulted, who will advise the mother accordingly. Children's feet should be permitted to develop naturally and should not be restricted in their movements. For outdoor use during the summer months a firmer but flexible-soled shoe should be worn. Children under two years of age should not be encouraged to walk outdoors during the winter months.

**337. Bathing.** Every baby should be bathed at least once a day. During hot weather sponge baths may be given in addition to the tub bath. The temperature of the water should be between 90° and 95° F. in the early months. At the end of the first year the temperature may be lowered to 85°. It is essential that the temperature of the water be taken before the baby is placed in the tub. Severe burns have occurred where the attendant had failed to test the temperature of the water before placing the baby in the tub. For the same reason, hot water should never be added to the bath while the baby is in the tub. At first the bath should not take longer than three minutes, but the time may be gradually increased to five minutes as the child grows older. At the age of nine months or one year the baby may be allowed to play in the water for about ten minutes if he is carefully watched.

The baby's wash cloths and towels should not be used for any other purpose or by another member of the family. They should be washed and dried each time they have been used. It is essential that the baby's skin be thoroughly dry before he is dressed. If this is done, the use of dusting powders is unnecessary. Moist skin, especially in the folds, will chafe more readily than dry skin.

**338. Sleep.** During the first year of life the baby's brain grows to be two and one-half times as large as it was at birth, and his body three times as large. While he is growing so fast he must have plenty of sleep. A healthy newborn baby should sleep nearly all the time except when he is nursing or being bathed. During the second and third months he should sleep eighteen hours; from the sixth to the twelfth month he should sleep twelve hours at night with a two-hour nap in the morning and again in the afternoon. In the second year of life and until the child enters school he should sleep twelve hours at night, with at least one two-hour nap during the day, preferably after the noon meal.

Proper habits of sleep are essential to the good health of a child. He should sleep in a crib or bed by himself (never with the mother) and, whenever possible, in a room by himself, where he need not be disturbed by the presence of other people, and where light, warmth, and ventilation may be adjusted to his particular needs.

The baby's night clothing should consist of a light-weight shirt, diaper, and nightgown. During cold weather light-weight stockings may be used. Older children should wear a sleeping garment in the form of a one-piece suit and for them stockings and undershirt should not be used. Although the sleeping room should be thoroughly ventilated, and the room temperature at night be about 50° to 60° F., care should be taken not to use too many or too heavy blankets. Two or three thicknesses of a woolen blanket will give sufficient warmth without causing the child to be too warm, in which case he will kick off the blankets.

The infant should be put to bed regularly at the same hour during the day and in the evening. The bed linen should be clean and the baby's clothes fresh and dry. The room should be darkened, quiet, and properly ventilated. Breaking the routine for father, who happens to come in late from business, or for baby's aunt or some favorite visitor is usually productive of bad results. Once the baby has been placed in his room, he should not be disturbed by doors opening and closing. Uncalled-for disturbances of this character are apt to make the child conscious that someone is in his room, and he will be wakeful as a result. Restlessness may be caused also by too much excitement before bedtime.

**339. Sunlight and growth.** Sunlight is one of the most important factors in the life of a growing child, especially a baby. Although the value of the utilization of this gift of nature has been known in a general way for a long time, it has not been given sufficient attention until recent years, during which

knowledge of the effect of sunlight on the growth of children has become more specific. Dr. Alfred F. Hess of New York City has contributed much to our knowledge of this subject.

Normal growth of bone is dependent not only on the food that the infant eats but also on the direct sunlight that he receives, for sunlight provides the body with the power to utilize food. If the infant is constantly deprived of direct sunlight, especially in the winter months, his bones will not develop normally, his muscles will be flabby, and his skin will be pale. Such babies are sure to develop what is known as rickets. Rickets is a very common disease among infants, developing especially from October to the end of March. It is a disease of growth that affects the whole body, but chiefly the bones. In hot climates, where children are out doors throughout the year, rickets is little known; in temperate climates, where children are indoors a large part of the year, it is prevalent. So far as is known, food has no direct influence on this disease. In the temperate zones fully 75 per cent of bottle-fed infants and 50 per cent of those that are breast-fed develop rickets, provided they do not receive sunlight,

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FIG. 126. Artificial sunlight

This quartz lamp supplies the ultra-violet rays which are largely absent from sunlight in winter. This child is being treated for rickets

or are given cod-liver oil or some other antirachitic agent which will serve as a preventive measure.

Window glass bars ultra-violet rays. The sun's rays, when passed through a prism, divide into the well-known spectrum of colors: red, orange, yellow, green, blue, and violet. Beyond each end of this visible spectrum are invisible rays. At one end are the infra-red rays that produce heat, and at the other end are the ultra-violet rays that have a powerful effect on living matter, destroying bacteria and strengthening the human body against such diseases as rickets and tuberculosis. When sunlight passes through window glass the visible rays and the heat rays pass through, but the ultra-violet rays do not. In the same way, heat rays may penetrate clothing, but ultra-violet rays do not. Quartz glass, which permits the passage of the ultra-violet rays, is now beginning to be used in hospitals and schools.

**340. Direct rays essential.** The beneficial effect of sunlight is not obtained unless the rays reach the skin directly. The interposition of clothing or window glass keeps out the ultra-violet rays. It is only when the skin begins to be tanned that any benefit may be expected. In the north temperate zone it is usually possible for normal babies to have outdoor sun baths from the beginning of March until the first of October, provided that the place for the sun bath is protected from the wind. Sun baths should be begun when the baby is three or four weeks old. A baby born in the spring or summer, therefore, can have outdoor sun baths earlier than a fall or a winter baby. Fall and winter babies, however, can be outdoors on bright days and get whatever sunlight there is. Many mothers hesitate to put their babies outdoors in cold weather, not realizing that in the sun the temperature may register 40° or 50° more than in the shade. On very cold days, however, a sun bath may be given indoors before an open window. The baby should be placed in the path of the

sunlight coming through the open space. The periods of this exposure should be longer than the outdoor periods in summer, and they should be between 11 and 12 o'clock noon, when the rays of the sun are most intense. The more a baby who was born in the fall or winter is exposed to this form of sun treatment, the less likely is he to develop rickets.



Fig. 127. Sunshine makes for health

These children are at the famous Rollier Sanitarium in Switzerland, where they are receiving the sun treatment for tuberculosis

**341. How to give a sun bath.** On the first sunny day in the early spring the baby may be put in the direct sunlight outdoors. The hood of the carriage and the baby's cap should be pushed well back, so that the sun will shine directly on his face and head. Since he will close his eyes when the sun falls on his face, no fear need be felt that the eyes will be injured through such exposure. On the first day his hands and forearms should be exposed, as well as the lower limbs. At the

beginning the feet may be protected with rolled socks, which should reach above the ankles. Care should be taken not to burn the skin. A fifteen-minute exposure on the first day is sufficient. Each day thereafter the exposure to the sun should be increased by five minutes, until the baby can be kept in the sun for one hour. A slight reddening of the skin each day will bring about pigmentation, or tanning. Every few days the amount of body surface exposed should be increased — at first slightly; then, as the days grow warmer, more rapidly.

**342. Sun baths for older children.** If sun baths are of primary importance for the baby, they are also of great value for the run-about and the child of pre-school age. Clothing for sun baths should be low in the back, short in the legs, and without sleeves. An ordinary bathing suit or bathing trunks alone may be worn. Such sun baths may be given in the fields, in the city back yards, on the roof, on the porch, or at the beach. Care should be taken not to let the child's skin become sunburned severely. The time rule for exposing infants to the direct rays of the sun should apply to older children. Tanning is the goal for which to strive, and the process must be gradual.

**343. Feeding the infant.** The health of the infant is largely dependent on his feeding. Artificially fed babies are more likely to have digestive upsets and to be less robust than those fed in a natural way. The subject of infant-feeding is highly complicated. Problems of this kind should be referred to a competent physician, and his advice should be followed with care.

**344. Care of milk in the home.** Milk used for infants must be clean, fresh, and protected against flies and odors. The growth of bacteria in milk is suppressed by keeping the milk cold. The temperature of the ice box should not be higher than 45° F. At this temperature harmful bacteria will not grow. In placing the milk in the upper compartment of the

ice box, place it as close to the ice as is possible; bottles filled with modified milk should be placed in a wire rack to prevent spilling or breakage. Sterile absorbent cotton should be used to cork the bottles. The feeding bottles should be thoroughly cleaned in boiling water. Extreme cleanliness is very desirable.

FIG. 128. Carefulness and cleanliness are essential in preparing the baby's food

**345. Regularity of feeding.** All infants should be fed at regular intervals and they should be awakened when feedings are due. Very young infants should be fed every three hours during the day and every four hours at night. As the child grows older feeding at night should be omitted. Nothing should be given to infants and young babies between feedings, except cool boiled water on hot days to relieve thirst. When one considers that an infant's diet is exclusively a liquid one, especially during the first six months, one can understand why it is unnecessary to force water on him.

**346. Additional diet.** A soft diet, consisting of cereals, vegetables, and zwieback, should be begun at six months of age. Orange juice and cod-liver oil should be started two weeks after birth. Cod-liver oil may be omitted during the summer months. The whole-grain cereals are to be preferred to the

white-flour cereals. Additions to the diet should be made gradually as the child grows older. These additions may be stewed fruits, graham or bran crackers, simple puddings, mashed banana, raw scraped apple, egg yolk, bread crumbs and butter, and thick soups.

From the twelfth to the eighteenth month the amount of milk should be reduced from one quart to twenty ounces daily; from the eighteenth month on the child should receive not more than one pint daily. This quantity refers to liquid milk. Additional milk may be partaken of in the form of milk puddings, cream soups, gravies, and ice cream. From the eighteenth month on, meat and fish, well chopped, should be served broiled or baked. Bread and butter should be included in the diet. Care should be taken never to overfeed a child, especially during the summer months.

**347. Care of the bowels.** There should be a natural evacuation of the bowels daily. Some children require one evacuation; others require two or even three to maintain good health. Natural evacuations can be brought about through proper training as early as the third or fourth month. Regularity of habit is absolutely essential to the normal function of the bowel. Laxatives should not be resorted to. Constipation during adult life can often be traced to the habit of giving laxatives during infancy and early childhood. Many mothers give their children laxatives at regular weekly intervals, whether they are required or not.

Since constipation is frequently located in the lowest part of the bowel, it is exceedingly unwise to irritate the membrane of the first twenty or twenty-five feet of bowel with laxatives to get to the last twelve or fifteen inches. In emergencies local measures should be resorted to in the form of glycerin suppositories or enemas of soap and warm water. The character of the infant's stool is often an aid in determining how well he is digesting his food. Green, loose, and

frequent stools, and stools with mucus, are indications that the child is upset. At the sign of such bowel disorders a physician should be consulted. Home remedies, especially castor oil, should never be given to the infant unless under specific instructions of a physician who has examined the baby. It is unwise to seek telephone advice from a physician, especially with reference to a disturbance of the bowels, when he has not examined the baby for such disturbance within twenty-four hours.

**348. Diseases of infancy and early childhood.** The diseases of infancy and early childhood, particularly the contagious diseases, such as measles, diphtheria, scarlet fever, and whooping cough, are infinitely more serious in their consequences than has been realized in the past. Not only do these diseases kill thousands of children outright, but they leave in their trail consequences of the most unfortunate kind. The oft-repeated statement that "children may as well have these diseases and be through with them" is fortunately dying fast. With the constant increase in knowledge of the factors that predispose and lead to sickness, and with the application of well-established and scientifically sound rules for prevention of disease, the death rate from diseases common among infants and children is rapidly decreasing. If the child is protected from contagious diseases during early childhood, he may altogether escape the dangers attendant upon them, for immunity to most of these diseases is acquired as one grows older.

It should be the aim of all mothers, therefore, to learn how to save their children from needless illness. A contagious disease is spread by bacteria of known or unknown origin. It is passed on to the baby from someone who has it, by coughing, sneezing, kissing, or handling, and by handkerchiefs, bedding, or other articles that have been soiled with discharges of the mouth, nose, or throat. It is safer, better,

and cheaper to keep a child well than to try to cure him after he is sick. Colds with fever, pneumonia, or abscesses of the ear are very common during infancy and early childhood. In the United States during the past ten years over one fifth of all deaths of children under one year of age were due to "colds" and their complications.

**349. Preventive measures.** Keep away from the child everyone who coughs, sneezes, or has a cold, a sore throat, a fever, or is otherwise sick. The "little cold" of a big person may mean a "big cold" in the little person. Babies and little children should be kept away from crowds and crowded places. Orange juice will protect the infant against scurvy; and cod-liver oil or irradiated ergosterol (a recently discovered agent containing the vitamin D, and estimated to be twenty thousand times as powerful as cod-liver oil) will prevent rickets. The use of both should be started within the first two weeks after birth. Every child should be vaccinated against smallpox at six months of age, and at nine months of age he should be given toxin-antitoxin to prevent diphtheria. Children treated with toxin-antitoxin should be Schick-tested six months after the last inoculation to determine whether or not they are immune.

Children who are susceptible to scarlet fever, as determined by the Dick test, should be immunized with four inoculations of the specific scarlet-fever toxin at weekly intervals. A second test should be made four to six weeks later to see if immunity has been established. The ravages of measles may be overcome with the use of blood serum from patients convalescing from measles. Scientists are now working on a new protective serum to be derived from goats' blood, for the same purpose.

**350. Keeping the children well.** During the first year an infant should be seen once a month, unless some unusual circumstance makes it necessary to have him under observation

more frequently, by a competent physician trained in the care of infants and young children. During the second year the well child should be seen by his physician from three to four times a year, and from that time on, until he is ready for school, he should be thoroughly examined twice a year.

Ewing Galloway

FIG. 129. This beautiful and up-to-date playground adds to the health and happiness of a neighborhood

We are living in an age of preventive medicine. Regular, systematic examinations will disclose physical illness and hygienic abnormalities in their very beginnings, and at these early stages remedial measures result in early corrections and cure. During such visits the medical adviser and the mother will have many opportunities to discuss health problems as they arise in the home, and all for the betterment of the growing child. These intimate health talks will do much to educate

the mother and will offset the misinformation she is apt to receive from persons not so well qualified to talk authoritatively on health. Six months or more before the child is ready to enter school he should be gone over thoroughly to ascertain whether or not he is physically and mentally ready and equipped to take up school life. Such a health survey should include an examination of the eyes for any abnormalities of the visual apparatus, an examination of the hearing apparatus, teeth, and nutrition, and an examination of the upper respiratory tract, especially the tonsils, the adenoid tissue, and the nasal sinuses.

**351. Race hygiene.** Many students of hygiene and sanitation are interested in measures looking forward to a healthier race. There are two ways of accomplishing this end: the first is to take measures to provide a more healthful environment for each generation, so that both children and adults may have an increasingly better chance to live long and happily; the second is to insure a better inheritance for the coming generations.

**352. Heredity and the improvement of the race.** One of the most important of biological laws is that of heredity. Like tends to beget like. Corn produces corn; sheep produce sheep. Not only do plants and animals produce after their kind, but they tend to produce certain physical traits, and, in the case of higher animals and men, certain mental characteristics as well. Thus we notice likenesses among children of the same family. It may be in the color of the eyes, in the stature, or in some special ability or disability.

In the breeding and rearing of plants and animals wonders have been performed. As evidence of this we need only to consider the miracles of a wizard like Luther Burbank, who was able to produce varieties and characteristics in plants almost at will. This was accomplished largely by proper selection. Even the unscientifically trained farmer knows that

to produce a large yield of corn it is necessary to choose the best corn for seed. In like manner, it seems true that a better race could be produced if those who were physically and mentally the best should marry and have children. While the subject of inheritance among human beings is still imperfectly understood, it is pretty well agreed by scientists that the mating of people who are feeble-minded tends to produce feeble-minded, and the mating of those who are mentally

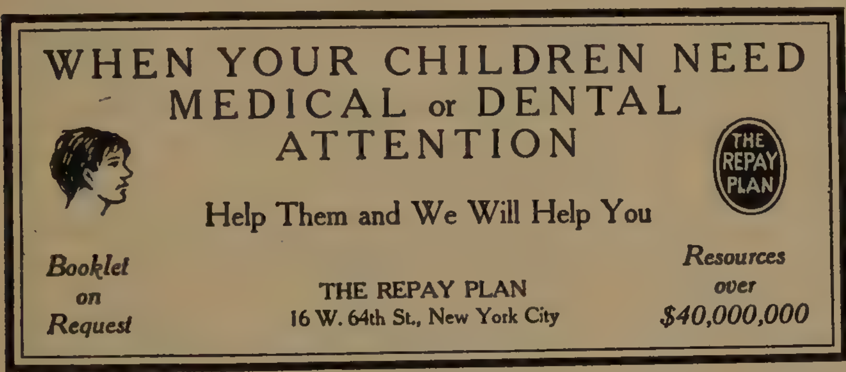



FIG. 130. Banks are beginning to be interested in helping parents who wish to keep their families healthy

superior leads to the production of mentally superior children. Unfortunately the higher intellectual classes include families where there are few children, or only one, or none. Many scientists believe that the number of people born with high intellectual ability is on the decline.

Those of lower intellectual caliber are more apt to have large families of children. Since marriage among human beings is controlled largely by sentiment rather than by science, there seems to be no remedy for this situation. It is true that in some states laws have been passed forbidding the feeble-minded and certain others to marry, but these laws usually refer only to a very small part of the population. Then, too, these laws are poorly enforced.

We have meager knowledge as to the inheritance of disease and of susceptibility to disease, but it is generally agreed that infectious disease is not transmitted by inheritance. Some forms of insanity are known to be hereditary. Tendencies toward certain diseases are inherited. One may inherit a susceptible mucous membrane, so that he is more likely to develop hay fever or asthma. It is noticeable that tuberculosis tends to run in families. This may be due in part to the inheritance of susceptibility, but in the newer light of science we see that it is probably due largely to the infection of little children by parents who have the disease.

Those who are about to marry should consider the question of heredity and its influence on posterity. Scientifically there is sound basis for the advice to choose in marriage those who have a healthful inheritance both physically and mentally.

The importance of the health of the mother before and after the birth of children cannot be exaggerated. There is no scientific reason for the superstitious belief in "marking." This is the belief that the mental state of the expectant mother will influence the life of the child both physically and mentally. The nutrition of the mother, freedom from the use of alcohol and drugs, and general good health are necessarily of fundamental importance in producing a healthier race.

*For Informal Discussion in Class and at Home*

1. What are two effective ways to guard against rickets? scurvy?

2. Explain the term "preventive medicine" from the standpoint of infant welfare.

3. Defend the statement "To live well is to be born well."

4. Draw a word picture of a physically and mentally normal baby six months of age.

5. If during your spare time you were employed as a nursery maid, how would you outline the baby's daily routine?

6. Reply to this statement: "I would not expose my baby to the sun, for fear that he would develop sunstroke."

7. What general effect on the baby's health has a tanning of his skin? What specific change takes place in his bones? in his blood? What conditions does it prevent? What conditions does it cure?

8. What is nature's safest and best food for infants?

9. What articles of food should you add to baby's diet after six months?

10. Defend the proposition that it is cheap health insurance to have the baby examined by a competent baby doctor once a month during its first year.

11. Why is it safer never to have had the contagious diseases of early childhood than to have had them, even though we have recovered? State the relationship to degenerative diseases. Do we still believe that "children may as well contract contagious diseases and be through with them"?

12. Outline a health-protective program for a baby during its first year of life; for a pre-school child.

13. Visit a baby-welfare station. Report what you observed.

# CHAPTER XXIV

## HEALTH IN THE HOME

**353. Importance of health in the home.** The kind of home that one lives in has much to do with health. Most of us spend the majority of our twenty-four hours at home. If the house we live in has healthful surroundings, proper heating, ventilating, plumbing, sunshine, and the like, the possibility of leading a healthful life is greatly enhanced.

**354. The site of a dwelling.** In building, buying, or renting a house the place where it is located is important. High land, well drained and exposed to sunshine, is favorable for health. Low, marshy land is not only unsightly but often dangerous, because it may be a breeding place for malarial mosquitoes. Filled-in land is often water soaked and may yield objectionable odors because of decayed materials. A house closely surrounded by shade trees may be attractive to some people, but such a place is objectionable. Shade trees first of all tend to make a dwelling damp and shut out the antiseptic and curative qualities of the sunshine.

**355. Building regulations.** People in rural communities have few if any restrictions as to building, but in cities there are usually strict regulations as to living quarters. These rules vary in different cities. A building bureau and tenement-house department ordinarily have control of matters pertaining to the structure, safety, and maintenance of living quarters. In many states there are laws which require municipalities to standardize the construction not only of tenements — buildings occupied as a home or residence by three or more families who live independently of each other and do their cooking on

the premises — but also of one-family and two-family houses. Where there is a building bureau all owners who desire to build new houses must file their plans with it. This bureau has rules which regulate the size of buildings, the light, ventilation, sanitary conveniences, and protection against fire. A building permit is granted if the plans and specifications

FIG. 131. The home is the foundation of health and happiness

comply with the building code. The tenement-house department further guards health and safety by enforcing its rules and regulations after the building is completed.

Some of the most important regulations usually are that every room shall have at least one window opening on the street or on a yard or court, that the walls and ceilings of the cellar shall be damp-proof, that a sink and running water shall be provided for each apartment, that all leaks in plumbing shall be repaired immediately, that all fire escapes shall be kept painted and in good repair and unobstructed, and

that no room shall be overcrowded. In New York City there is a special bureau which supervises the old-law tenements; its work consists largely of investigations regarding the cleanliness, safety, or drainage of cellars, safety appliances, leaky roofs, halls, plumbing, and yards.

In our larger cities most people live, work, and play in buildings of some kind. It is essential that these shall be constructed so as to be as safe and sanitary as can reasonably be. People who are raised in the cities sometimes fail to appreciate the safeguards which the regulations of the city throw round them. The difference in the appearance, cleanliness, light, size of rooms, height of ceilings, and plumbing between the old-law and the newer buildings in New York City indicates the progress that has been made in housing.

**356. Sanitary cellars.** One of the most pleasant and healthful features of many new buildings is the cellar. Often it looks as clean and wholesome as any part of the house. It is still true, however, that a large number of cellars, especially in country districts, are dark, damp holes with visible moisture present and with poor ventilation. The cellar should be so well constructed, with enough windows, a cement floor, and whitewashed walls, that it is a really attractive part of the house and as easy to take care of as any other part of the house.

**357. The lighting in the home.** The best kind of light is sunlight, because it is a disinfectant, stimulates nutrition, and is generally the best kind of light for the eye in doing fine work. One of the chief essentials of a home is sufficient window space to provide light and air.

Kerosene, gas, and electricity are the chief sources of artificial illumination today. Of these three the best is electricity. It is the safest, does not flicker, and is most convenient because it is most easily controlled and because of the great variety of fixtures that are available. Unlike kerosene and

gas, it does not add much heat to the air and does not vitiate the air. Both gas and kerosene lights are dangerous and often contribute a disagreeable smell. Either gas or electricity offers as good light for the eyes as a kerosene lamp if the right fixtures are used. It is worth while to select carefully.

FIG. 132. Modern inventions make the cellar as sanitary as any other part of a house

Courtesy of American Radiator Co.

Great improvements have been brought about in recent years by indirect lighting. In direct lighting the rays of light are thrown directly upon the object to be illuminated; in indirect lighting the rays of light are reflected from the ceiling. In semi-indirect lighting the rays are diffused through a translucent globe. Through the use of the indirect and semi-indirect forms of lighting there is less glare, more diffusion of light, and less strain on the eyes. In private homes indirect

lighting is mostly used in halls, reception rooms, and the general lighting of rooms. Floor lamps and table lamps with shades are to be recommended for reading.

**358. The disposal of garbage, rubbish, and ashes in cities.** The wastes that occur in a family are of three kinds: garbage, rubbish, and ashes. Family wastes constitute the greatest

Keystone View Co.

FIG. 133. Good lighting prevents eyestrain and nervousness

bulk for removal by the collectors of waste in a city or town. This removal can be greatly facilitated if the householder will use a metal-covered can capable of holding not more than one hundred pounds of refuse. Large cans are not easily handled. Garbage in the house or upon the street may be a menace to health, because it readily decays and may pollute the air and soil about it. The removal of ashes should be carefully done. While ashes are not a menace to health, the dust that arises is to be avoided because of the effect upon

the respiratory tract and lungs. Because of the fire hazard, precaution should be taken never to put hot ashes in a wooden box.

What to do with rubbish, such as newspapers, paper wrappings, excelsior, cardboard, old beds, mattresses, broken furniture, tin cans, is a problem. In cities rubbish should be made up into bundles as far as possible and tied or packed before being placed for removal, to prevent them from being blown away. Every thoughtful citizen should dispose of waste in a manner that will conserve the health of the people and promote cleanliness and tidiness.

The problem of the ultimate disposal of waste by the municipalities is not always easily solved. It is estimated that in a city the size of New York if all the waste for one day were dumped in one spot, it would cover an area of over eight acres and be higher than the Woolworth Building.

The most difficult disposal is that of garbage. The location of "reduction" plants, where oils and fats are removed and sold in commercial markets, frequently brings protests from citizens because of the odors emanating while the plant is in operation or during the transportation of the garbage to the plant. In New York City the garbage is towed forty miles out to sea and dumped. Here, again, complaints are registered by those living along the coast, who state that the tide and wind cause the garbage to be blown upon the shore and remain there. Probably the safest method is to burn the garbage in an incinerator. This produces no odor and leaves a very small residue.

In many cities the ashes are used to fill in low lands and swampy places; this may return a profit to the city if land values are high enough.

In the larger cities the disposal of rubbish may also net the city a profit because contractors are willing to pay for the privilege of salvaging anything that is salable.

The disposal of liquid wastes, commonly known as sewage, is always a difficult problem. Those who live in the cities seldom give the matter consideration, because the system of sewers receives the liquid waste from the kitchen and bathroom, and the average citizen is free from obligations concerning its removal. This waste empties into river, lake, or ocean, with consequent pollution. Water receiving sewage is, of course, unsafe for drinking or bathing. The construction of sewage-treatment plants has proved effective but expensive. It is the only safe method if the waters are to remain unpolluted.

The effective removal of wastes is possible, but at great cost to the taxpayers. The question that must be answered by the taxpayers of any community is what they are willing to pay for safe sanitation.

**359. Removal of wastes in rural communities.** In many small towns and rural communities the removal of waste must be done by the individual householder himself. The garbage, ashes, refuse, and liquid waste are not collected by "white wings" or by means of sewers. The difference between well-kept premises and a slovenly exterior is largely that of household sanitation.

The first requisite in regard to garbage is that it be burned or buried. Until that can be done, it should be kept in a metal can, tightly covered so as to keep away flies and other insects. Oftentimes the fresh garbage is fed to chickens and hogs, which is a most satisfactory disposal of such waste as peelings, lettuce leaves, stale bread, etc. It is never advisable to feed decayed vegetable matter to animals. An incinerator is a valuable adjunct to burn such garbage as cannot be properly disposed of otherwise.

In the colder climates the ashes may be allowed to accumulate until the warm days of spring. They should then be removed and the yard or storage place thoroughly cleaned

of all rubbish as a means of reducing the fire hazard, for cleanliness, and for æsthetic reasons.

**360. Disposal of sewage in rural homes.** The disposal of the liquid wastes is a more serious problem. There is always the possible factor of the causation of disease. The sewage should be removed from the house as soon as possible after its production, whether from the kitchen sink or the bathroom. The water-flush system is probably the best. This, however, is not always possible, on account of the location, the proximity of other houses, and the construction cost. The use of the primitive privy vault is then necessary. The vault should be made water-tight, so that none of its contents may escape to pollute the surrounding soil or contaminate the ground water in the neighborhood. The pits should be thoroughly ventilated and screened to keep out flies.

The addition of a solution of chlorinated lime or sulphate of iron will do much to check bacterial growth and to prevent offensive putrefactive odors.

The "pail" system is used in many places. The pail, being limited in its capacity, must be frequently emptied of its contents and buried in a safe place. The outbuilding used for this purpose should of course be kept clean and properly ventilated. Earth closets are sometimes used in conjunction with the pail system. Dry loose dirt is thrown upon the dejecta so as to render them inodorous and inoffensive. The mixture soon becomes practically nothing but humus and may be used with safety as a fertilizer. The pail or the earth closet is well adapted to isolated houses, and to small communities where each householder is expected to take care of the necessary details and no general water supply exists.

The waste should be kept as dry as possible to lessen putrefaction and the production of disagreeable odors. For this reason wash water and the liquid wastes from the kitchen should be disposed of separately. Where there is a water

supply to a house but no sewer connections, provision must be made to carry off the waste. There are various successful methods used, such as straining, sedimentation, septic tanks, and filtration and irrigation.

Straining is accomplished by various kinds of filters made of coke or of buckwheat coal.

Sedimentation treatment allows the sewage to flow slowly through a tank, permitting the sludge to settle at the bottom. Sewage may be collected in large tanks and treated with chemicals such as lime, alum, or sulphate of iron to increase precipitation.

The septic-tank method of disposal aims to destroy as much as possible of the sewage by rapid natural decay, keeping it where it can do no harm during this process.

The aim of these methods is to render the sewage as free from sediment and pollution as possible, so that the overflow may not contaminate the soil or stream. In a short treatise of this kind it is only possible to suggest the various devices used. For further detailed methods reference may be made to the various publications of the Department of Agriculture on this subject.

**361. Household pests.** It has been pointed out elsewhere that serious diseases, such as malaria, yellow fever, and bubonic plague, are transmitted by insects and rats.

For protection against flies, mosquitoes, and other insects the dwelling should be protected by the screening of windows and doors. All garbage should be kept in covered containers. Dishwater and other slops should not be thrown on the surface of the ground, except on a light, porous soil at a distance from the house. Stagnant water found in tin cans and undrained pools is a fertile breeding medium for mosquitoes. Filth, such as manure and decaying vegetable matter, furnishes the soil for the propagation of flies. For this reason a well-kept backyard is a safer place than one that is ill-kept.

Cockroaches may carry disease germs and should be speedily exterminated. Fleas and rats may also be the cause of infections, especially during epidemics.

Every precaution should be taken to keep the house free from all forms of vermin. "Swat the fly" should be a slogan of every household.

**362. Plumbing.** It is needless to say that plumbing should be of the best possible type to prevent leakage of liquid and gases. Building departments, which authorize traps for all pipes leading to sewer connections, and outside vents for the main drain pipes to allow the escape of gases and odors, enforce the essentials of sanitary plumbing.

Sleeping rooms, bathrooms, and water closets into which sewer gas may escape should be ventilated, to obviate any pollution of the air. It is a good habit to flush sleeping rooms daily with fresh air by opening all windows wide for an hour or more.

To safeguard against any possible contamination it is important to see that the plumbing is kept in good repair. Formerly lead pipes were used to convey drinking-water into the house. Many cases of lead poisoning, resulting in death, were caused by the absorption of lead into the body. This occurs when the water contains an excess of carbon dioxide, which may attack the lead and produce a substance that is highly poisonous. Brass pipes are preferable.

**363. The ice box.** In warm weather food deteriorates rapidly unless it is put into an ice box, or refrigerator. This is especially true of food from cold storage. The health department and other city departments do much to insure a healthful food supply. The housewife should be equally alert in providing a clean, properly iced or electrified refrigerator. Foods which readily absorb odors (especially foods which contain fats or oils, such as milk and butter) should not be exposed to the fumes from strongly odorous foods.

During the hot summer months it is customary to use ice water as a drink. If the water is not drunk in large quantities or too rapidly, it will probably do no harm, provided the ice is pure. The best method of supplying cold drinking-water is to fill a bottle with water and place it in the refrigerator to cool.

**364. The bathroom.** Since the bathroom is used in common by all the members of the family, it may be a means of transmitting infectious diseases unless hygienic precautions are observed. Sore throat, grip, colds, and other infectious diseases may easily be conveyed by unclean faucet handles, door knobs, and other bathroom equipment. These should be cleaned frequently and with regularity. Every member of the family should be supplied with individual towels and wash cloths. Special precautions should be taken if one has a cold. After washing, the bowl should be flushed with hot water. A clean piece of paper may be used in turning a faucet handle so that another member of the family who uses the handle afterwards may not be contaminated. Bathtubs should be thoroughly washed with hot soapy water and rinsed with hot water before using. Bathroom and toilets should be thoroughly aired.

**365. Cleaning.** The vacuum cleaner has solved many of the health problems relating to dust. It removes the dust from carpets or rugs with ease and without forcing it into the air. Rugs are better than carpets, because they have less lint-producing surface and also because they can be handled more easily and cleaned oftener. The dry dust cloths are still used too much, and the ones advertised in stores as dustless cloths are often expensive. Instead of using a dry cloth it would be better to use cloths saturated in water, kerosene, or furniture polish, depending upon the character of the work to be done. Dry sweeping should not be tolerated. Moistened sawdust or paper sprinkled on a floor greatly aids sweeping. The prevail-

ing fashion, which is commendable from the point of view of health, is to furnish rooms simply, with as little to catch dust as is compatible with looks and comfort.

**366. The kitchen.** The place where food is handled and prepared for the family should be one of the most sanitary parts

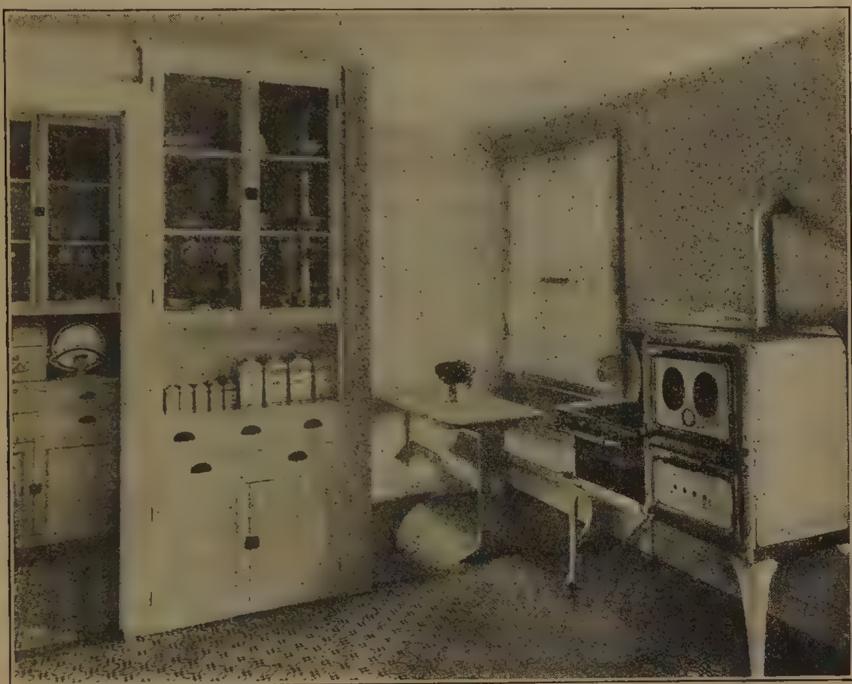


FIG. 134. A clean, attractive kitchen is one of the essentials of healthful living

Courtesy of *The House Beautiful*

of the house. The walls of the kitchen should be painted attractively. All the equipment should be scrupulously clean.

The kitchen should be screened and carefully protected against insects. Mice may be dangerous because they live in filthy places and may convey disease by walking over food.

Frequently the kitchen employee is quite ignorant of the laws of hygiene and has many unsanitary habits. If in addition to this she is ill or a carrier of some disease, she becomes

an even greater menace to the family. The one preparing food should consider others. Licking the fingers, or handling a handkerchief while handling food or dishes and using the dish towel as a hand towel, are disgusting and dangerous habits whether performed by the kitchen employee or by members of the family. Care should be taken to prevent dangers through the carelessness of others. Vegetables that are eaten raw should be thoroughly rubbed or scraped and should be rinsed in several waters. Since milk bottles are nearly always carried by the rim, or lip, over which the milk is poured, the bottles should be carefully washed before the top is removed, and special attention should be given to the rim.

The washing of the dishes is especially important, since by carelessness an infection may be transmitted through the family. Soapless, dirty dishwater is altogether too common. Scraps should be removed from the dishes before washing. There is no excuse for washing dishes in water filled with garbage. Dishes should be washed in hot soapy water and rubbed so as to loosen all food débris. Everything that comes directly in contact with the mouth, such as knives, forks, spoons, and glasses, should be thoroughly washed, even if they do not seem to be soiled. It is never safe to rinse eating and drinking utensils in anything but boiling-hot water. Since dish towels may get soiled and hands may be contaminated, it is better to arrange the dishes in a drainer, so that they will drain themselves readily after rinsing, and then let them dry without being touched. Dish cloths and dish towels should be thoroughly washed and dried. Exposing them to the direct rays of the sun is an excellent practice.

**367. Heating and ventilating.** Comfort and health in the home depend to a considerable extent on heating and ventilating. This subject is treated in detail in Chapter IV. It will suffice at this point to reëmphasize the desirability of keeping houses cool rather than hot. About 68° F. is the

optimum temperature. The air which we breathe and which comes in contact with our bodies should be moving rather than stationary and have a certain amount of humidity.

*For Informal Discussion in Class and at Home*

1. Describe a healthful site for a home.

2. Write down on a sheet of paper the necessary characteristics of a healthful home. Assign a score for each item. Let the total number of points equal 100. Let the members of the class compare their scales and formulate a scale for the grading of homes.

3. What are the building regulations in your city or town?

4. Describe in detail how the garbage, rubbish, and ashes of your community are disposed of.

5. How does the sewerage problem of the city differ from that of the country? Describe in detail the solution of this problem in the country.

6. What household pests are most common? In what way do they menace the health of a community? How may they be exterminated?

7. Bring to class questions about the healthful home that have not been presented by this chapter or by other members of the class.

## CHAPTER XXV

### SAFEGUARDING THE PUBLIC'S HEALTH

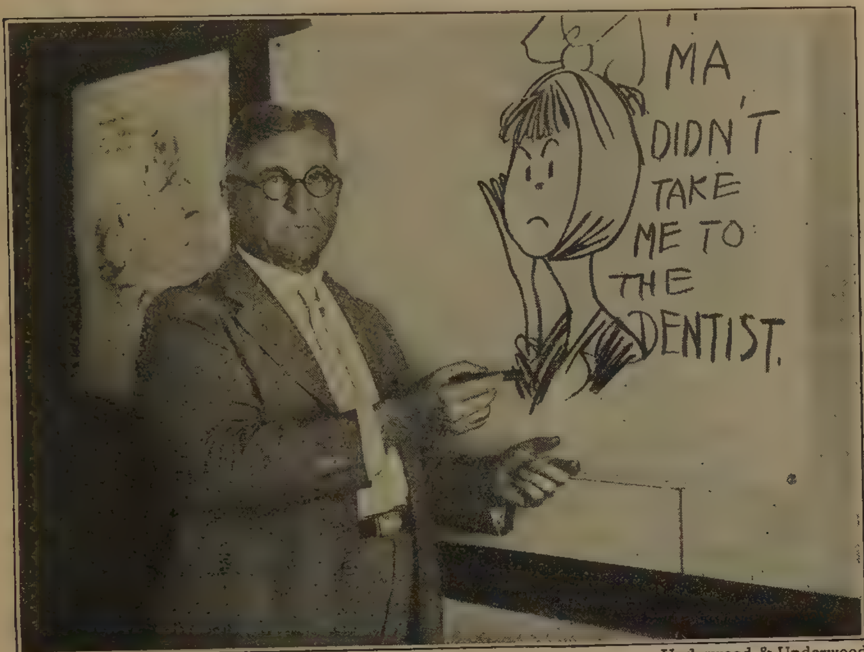
**368. The scope of public-health activities.** "Public health is purchasable. Within natural limitations any community can determine its own death rate." This slogan has been used by the New York State Department of Health for many years and has been adopted by health officers throughout the world. It is one of the most inspiring suggestions from public-health work. Today, for example, no city need have a typhoid epidemic if it is properly organized to fight disease and ill health. We have the scientific tools to prevent any such outbreak.

Public health concerns itself with the health of people in large groups, or communities. In the true sense the name means the practice of preventive and protective medicine under the direction of the Federal, state, and city governments.

It embraces many lines in sanitary engineering, such as the construction of factories to provide healthful working conditions for those who labor; proper planning of school buildings with a view to preserving the health of pupils; proper building of homes and tenements in order to promote the physical well-being of their occupants; proper location and construction of sewers to take care of the waste of the human family safely; proper supervision over the source and conveyance of water and food supplies to prevent contamination; drainage of swamps and ponds to protect the public from disease-bearing insects that breed in such places; inspection and analysis of food supplies that may convey pathogenic organisms; prevention and checking of epidemics of disease, — in short, it

embraces the employment of all measures that will prevent sickness and loss of life in the human family, individually or in the mass.

**369. Origin of the public-health movement.** The public-health movement is of comparatively recent origin in the




Underwood & Underwood

FIG. 135. A health cartoonist

Health departments are now doing much to educate the general public. This cartoonist is employed by a state department of health

United States. By an act of Congress on February 25, 1799, "officers of the United States are bound to observe the health laws of the State." After the Civil War boards of health were established in the principal cities. A national Board of Health was created on March 8, 1879. However, it was not until late in the nineteenth century that efficient health departments developed throughout the United States. This came with the discoveries at that period of enlightenment, when the cause

of communicable disease was discovered in that invisible world revealed by the microscope.

Scientific research has proved conclusively that infectious diseases are preventable and by such proof has rendered civilization an incalculable economic service.

**370. How public-health work pays.** The record of health achievements is one of the brightest chapters in the history of the American republic. Wherever the American flag has gone, even temporarily, there the trained health workers of the United States government have followed to initiate an aggressive campaign against disease and to promote positive health.

Cuba was a hotbed of yellow fever. Through the control of the stegomyia mosquito Havana became a safe place in which to live. The Panama Canal Zone had marked the graves of thousands of men who attempted to build a canal from ocean to ocean. Yellow fever again was the dreaded pest which smote those who would lay claim to the land. General Gorgas conquered the mosquito and the disease and completed one of the world's greatest engineering feats. Today the Canal Zone is one of the healthiest spots in the world. The Philippines and Porto Rico also testify to the beneficent power of public-health work. The control of pellagra, beriberi, and hookworm disease in our Southern states; the prevention and cure of simple goiter in the goiter belts; the complete eradication of foot-and-mouth disease, common until recently among cattle in the agricultural areas of our country: these are other examples of what is being done to promote the public health. These wonderful achievements will occupy forever a place among the high traditions and accomplishments in modern medical service.

**371. How the Federal government safeguards our health.** Since health problems in one state and in one section of the country differ essentially from those of other states in the

FIG. 136. The record of health achievements is one of the brightest chapters in the history of the American republic

This picture shows an American scientist dealing with microscopic foes of humanity

Union, Congress has found it necessary to pass laws to protect the health of all citizens throughout the United States.

Among the major activities carried on by the Federal government are the following:

It protects the health of citizens of the United States from possible contagion from immigrants. Those who apply for

FIG. 137. The hygienic laboratory of the United States Public Health Service at Washington, D.C.

This famous institution has on its staff some of the foremost scientists of the country. They test the purity of serums, toxins, and similar products used in the prevention and cure of disease. Their reports are very valuable

entrance into our country are examined by physicians. If suffering from disease they are either quarantined until all danger of their spreading the disease is over, or returned to their own country. This protection applies particularly to cholera, yellow fever, scarlet fever, smallpox, typhus fever, leprosy, and trachoma.

It controls interstate waters to prevent pollution.

It supervises the production and sale of foods in interstate trade.

It builds and maintains Federal hospitals and sanatoriums.

It investigates national health problems and distributes information with reference to these studies and surveys.

It coöperates with state and city health departments by furnishing advice, serums, and trained workers when necessary.



FIG. 138. Examining the eyes of immigrants at Ellis Island

Inspections at ports of entry protect our citizens from disease

It exercises control over the production and sale of biological products such as serums, vaccines, and antitoxins.

It carries on public-health education campaigns.

These activities express in a superficial manner the extent and magnitude of Federal health service. The enforcement of such laws as are necessary to execute these activities is invested in four governmental departments: the Treasury Department, the Department of Agriculture, the Department of Labor, and the Department of the Interior.

**372. Health work of the Treasury Department.** The health work of this department is conducted through the *United States Public Health Service* under the direction of a surgeon-general. Many activities are carried on through its several divisions. It conducts scientific investigations into the cause and prevention of disease, gathers important statistics, publishes many helpful reports, and advises state and city health officials.

**373. Health work of the Department of Agriculture.** This important branch of the Federal public service concerns itself with everything that relates to scientific agriculture. Since the chief purpose of the agriculturist is to produce food, both vegetable and animal, for the millions of people in the United States, his main health interest centers in foods. Some of the activities carried on by this department are these:

Public-health work is greatly aided by home demonstrations. Agents go into rural districts and, by personal contact with the people and through talks and exhibits, help to foster public-health improvements and to educate the people.

The rural engineers in this department are experts on problems of farm water supply and rural sanitation. They have prepared some excellent bulletins on these subjects, which are issued free or at nominal cost.

The *Bureau of Entomology* carries on a relentless warfare against pests like flies, mosquitoes, and other disease-carrying insects which are a menace to public and personal health.

The *Bureau of Animal Industry* protects the public health against tuberculosis and other animal-borne diseases through inspection of cattle, meats, and dairy products. The public's greatest insurance against unwholesome meat is the blue stamp of government approval.

The *Bureau of Chemistry*, by insisting on pure foods, wages a relentless campaign to protect the public health. It has under its supervision the enforcement of the Pure Food and

Drugs Act, which was passed by Congress in 1908. This act requires all food products and medicines to be truthfully labeled. Through the operation of this law the public is protected against fraudulent and harmful alleged cures, patent medicines, and narcotic and habit-forming drugs, which otherwise would be taken without the knowledge of the ingredients of the advertised medicine. The label "Guaranteed under the Pure Food and Drugs Act" does not mean, as many suppose, that the United States government is guaranteeing the quality or quantity of the contents, but only that the manufacturer guarantees the goods to be what the label says they are. It protects the purchasing public against short weights and measures. Through this law people can learn at a glance whether or not an article contains preservatives such as benzoate of soda, coal-tar derivatives, artificial coloring agents, and dyes, and whether or not opiates, cocaine, alcohol, or other habit-forming drugs are present. Thus gullible, innocent persons are protected against unscrupulous manufacturers who might otherwise mislead the public through fraudulent advertisements.

**374. Health work of the Department of Labor.** In general this department seeks to improve the physical conditions of labor for the working classes. It exercises control over immigration, conducts medical inspection, and administers the quarantine laws.

The *Children's Bureau*, which has the responsibility of studying, advising on, and directing all matters pertaining to the welfare of children, is in this department. Its activities are concerned with child life and welfare, the birth rate, infant mortality, orphanages, desertion, juvenile courts, the employment of children, and legislation affecting them. The bureau publishes many important bulletins, of value to parents and schools, on mental and physical health. These bulletins are sent to schools and public libraries. Many of them are sent free to the general public.

**375. Health work of the Department of Commerce.** This department does much for the safety and welfare of those engaged in commerce.

The *Census Bureau* in this department collects national statistics and keeps the public informed of the most prevalent diseases. To a certain extent these statistics measure the success of the public in dealing with various diseases. The steady reduction in deaths from typhoid, for example, shows the success resulting from the scientific measures taken against disease; the increasing prevalence of smallpox in certain sections suggests a neglect of vaccination.

**376. Health work of the Department of the Interior.** The *Bureau of Education* in this department has a staff of workers who make surveys of school systems. They point out the defects and suggest helpful ways of improving public education. Some of its agents give lectures on health throughout the country. The most important health activity of this bureau is in publishing bulletins on teaching health to children. Within the last ten years thousands of these bulletins have been distributed among teachers and pupils and have contributed in no slight degree to the progress of health education throughout the country.

**377. How the state department of health safeguards our health.** Each state department of health functions in many fields of public-health work not specifically covered by the various divisions of the Federal government. The important features of state health departments consist mainly of a state-wide sanitary code, generally under the direction of a state health commissioner assisted by a staff of experts whose chief concern is the prevention of communicable diseases and the promotion and dissemination of health knowledge. Their functions include the study and prevention of infant mortality, the study of child welfare and maternity, and medical inspection of rural-school children. They study problems

concerning physical training for boys and girls, birth registrations, and pasteurization of milk. For physicians they make laboratory examinations of specimens; they prevent the pollution of streams, administer quarantine against contagious diseases when prevalent in neighboring states, distribute biological extracts and serums, and make free distribution of salvarsan to indigent people. They conduct nursing service, surveys, and studies of industrial hygiene. These various functions and health activities are administered by trained and expert physicians, public-health field nurses, engineers, bacteriologists, chemists, epidemiologists, and statisticians. Their work is conducted along a well-organized system of coöperation between Federal and local health authorities.

**378. How the city department of health safeguards our health.** Environment plays an important part in our health. In our daily work we come in contact with people from all walks of life; we travel in public conveyances, drink from city water supplies, eat food in public places, room in hotels, or live in apartments. As individuals we cannot devise or control sanitary measures that would protect us against disease. Coöperation through public effort, however, limits by law the rights of individuals to be careless and indifferent to the welfare of innocent and careful people. The law which empowers a local commissioner of health to issue licenses for slaughterhouses and chicken markets, to regulate proper heating in apartment houses, to issue health certificates to food handlers, to regulate the production and sale of milk, meats, and other edibles, and to exercise many other powers is known as the sanitary code. This code provides the commissioner of health with police powers and is almost limitless in its public-health safeguards.

The work of departments of health in our larger cities is generally carried on through several bureaus. The bureaus may be as follows:

1. *The Bureau of Child Hygiene.* The scope of the work of this bureau varies in different cities. In general, it supervises the child's health from birth to graduation from school or until an employment certificate is issued. The Bureau of Child Hygiene conducts baby-health stations where physicians and nurses instruct mothers in the care and feeding of their infants. It also conducts clinics, such as eye and dental clinics.

*Pathé News*

FIG. 139. A modern way of cleaning the streets

2. *The Bureau of Foods and Drugs.* This bureau is charged with the enforcement of all provisions of the sanitary code relating to the production, manufacture, handling, and sale of foods and drugs. It also enforces the regulations governing the conduct and maintenance of food establishments. Its officials inspect and supervise dairies, creameries, milk depots, and pasteurizing plants which supply milk and its products for consumption in the city. They also inspect and supervise the quality of all foodstuffs sold, and see that they are properly labeled and branded. They inspect and supervise the sale of

all sea food, inspect and supervise the quality of drugs sold, and supervise the registration of proprietary (so-called "patent") medicines. Examinations are made by the inspectors of the bureau to see if the contents and the quality are in keeping with the statements on the labels.

The Bureau of Foods and Drugs is also charged with the inspection of bakeries, confectioneries, carbonated water factories, cold-storage plants, commission houses, desiccated-egg establishments, fat-rendering plants, ice-cream factories, food factories, restaurants, slaughterhouses, warehouses, piers, railroad yards, and all retail food stores, including those dealing in groceries, delicatessen, fruits, vegetables, and fish.

3. *The Sanitary Bureau.* This bureau has a variety of activities. It enforces rules regarding plumbing, lighting, heating, and ventilation of buildings. It undertakes to eliminate conditions that favor the breeding of flies and mosquitoes. This means the oiling of stagnant water and the removal of garbage and wastes. The examination of samples of water and other measures to maintain a pure water supply are under the supervision of this bureau. In large cities the problem of rats is a constant menace to health, since rats have very filthy habits and contaminate a great deal of food. They also act as host for a flea which carries bubonic plague. Rats in a ship coming from a foreign port are likely to be undesirable immigrants because they are often carriers of disease. The Sanitary Bureau exterminates rats in buildings, piers, and vessels. This bureau also supervises the transportation of ashes and garbage through city streets, supervises bathing establishments, regulates the prevention of smoke and dust nuisances, and eliminates from public places the use of the common towel and drinking cup.

4. *The Bureau of Preventable Diseases.* This is one of the most important bureaus of the health department. It receives reports of all communicable diseases from private

physicians and from hospitals and other institutions. Every case of communicable disease carries with it possibilities of an epidemic; therefore the bureau promptly sends a specialist to make a diagnosis when there is doubt, and, by visiting nurses, to give to those exposed to communicable disease instruction in methods of prevention.

This bureau conducts clinics to vaccinate against smallpox and typhoid fever and to administer tetanus antitoxin and Pasteur treatments. These clinics also immunize against diphtheria with toxin-antitoxin and give Schick and Dick tests to determine immunity or susceptibility to diphtheria and scarlet fever. The bureau also regulates the muzzling of dogs and enforces the law against expectoration in public places.

5. *The Bureau of Laboratories.* The chief function of this division of the department of health is to manufacture vaccines, serums, antitoxins, and test materials used in the prevention and treatment of various communicable diseases. It also examines cultures for diphtheria bacilli, urine, stools and blood for typhoid bacilli, and conducts other laboratory work of value in the detection and prevention of disease. During the World War many of the laboratories of the larger cities throughout the United States supplied the armies and navies of the allied nations with serum, vaccine, and antitoxin.

6. *The Bureau of Hospitals.* This bureau cares for persons with communicable diseases.

7. *The Bureau of Records.* This bureau keeps a variety of records that relate to health work of the city, such as records of births, marriages, and deaths. These are used for admission to school, in obtaining employment certificates, and as proof of death, for insurance or inheritance purposes. It also provides for the registration of all practicing physicians in the community in order to safeguard the public against quacks and charlatans.

8. *The Bureau of Public Health Education.* That the health of a community may be protected and improved, the general public needs to be enlightened concerning matters of health and also concerning the policies of the department of health. For these purposes this bureau publishes various bulletins, offers public lectures, and presents exhibits and demonstrations on proper methods of living. It also attempts to keep physicians informed of the latest public-health measures.

**379. Other city departments safeguarding the city's health.** Outside of the health department there are other correlated agencies that help to safeguard a city's health. Among these are the following:

1. *The Department of Public Markets.* A department of public markets inspects all foodstuffs to see that the public gets fresh, wholesome food in honest measures. All food is examined on reaching the central public markets. Inspectors pay particular attention to milk and meat and make every effort to prevent the sale of spoiled or adulterated foods. Perishable foods, such as fruits and vegetables, receive the greatest attention. Once food is tagged "not fit for use" the owner must destroy or dump the consignment; otherwise he is subject to a heavy fine and frequently his permit or license is taken away from him. This department inspects and supervises cold-storage plants. Owners of these plants are required by law to stamp the date on which foods are sent to cold storage, in order that one can tell how long they have been kept there. Foodstuffs are not permitted to remain in cold storage longer than ten months, with the exception of butter, which may remain twelve months.

2. *The Department of Water Supply.* This department has an intimate relation to the public health. It keeps the water supply free from injurious bacteria and filth, through such measures as chlorination, filtration, and precipitation. It prevents possible pollution by maintaining an unpopulated area

at least five miles wide around the edges of the reservoirs. A force of special police is maintained by this department to prevent people from throwing refuse into the reservoirs.

3. *The Tenement-House Department.* This department carries out laws with reference to light, heat, ventilation, sanitary conveniences, and protection against fire of private dwellings, tenements, and public buildings.

4. *The Department of Street Cleaning.* This department keeps the city clean. It removes garbage, ashes, rubbish, and snow from streets. Garbage may be fed to hogs, or (as in New York City) it may be towed out to sea for a distance of forty miles and dumped, or it may be burned. The department disposes of sewage and, through the use of sewage-treatment plants, checks pollution of waters into which sewage is emptied.

5. *The Police Department.* This department conducts educational campaigns in an effort to reduce the number of street accidents, and prevents accidents through the operation of traffic signals. It renders first aid in emergencies and summons hospital ambulances. In some sections of some cities the police regulate play streets for children. There is a narcotic squad to prevent the unlawful sale, distribution, and use of narcotics.

6. *The Board of Education.* This board, with its large corps of teachers, occupies a first line of defense against diseases and the physical defects of early childhood. Teachers who inculcate hygienic habits pave the way to good health. Many schools are now very active in getting parents to remove the physical handicaps of children. Special schools provide training for those whose physical and mental handicaps make it difficult for them to compete with their companions.

**380. Private coöperation with public-health work.** Private health agencies and private physicians are by no means lacking in their efforts to assist official health agencies. The very gratifying results of smallpox vaccinations, of sanitary measures, of vaccinations against typhoid fever, of the use of

antitoxin and toxin-antitoxin for the treatment and prevention of diphtheria, of iodine in the treatment of simple endemic goiter, of scarlet-fever immunization, — these and other achievements speak well for the effective work of private physicians in the field of preventive medicine. Many scientific health measures continue to be sponsored by private organizations, such as the American Medical Association, state and county medical societies, the American Red Cross, the national and local tuberculosis associations, the American Child Health Association, the American Public Health Association, the National Safety Council, the National Committee for the Prevention of Blindness, the American Social Hygiene Association, the Eye Sight Conservation Council of America, the Rockefeller Institute, the Carnegie Foundation, life-insurance companies, and so on.

**381. Health departments in towns and rural communities.** The safeguarding of the public health is usually carried on much more efficiently in cities than in towns and rural communities. Often the rural departments or boards are not very active because of a lack of general interest in health problems. They are often greatly handicapped by a lack of the efficient machinery of the city departments of health, such as clinics, hospitals, and means of supervising the water and milk supplies.

### *For Informal Discussion in Class and at Home*

1. What is meant by the expression "public health is purchasable"? What sum of money did your city provide in its budget to protect the health of its citizens?

2. With what public-health agencies in your city are you acquainted? Name them. What are their functions? Where are they located?

3. What is the annual birth rate in your town? What is the mortality rate? How does the former compare with the latter?

4. What is your conception of public health? Who is the chief health officer in your city? What divisions of public health are under his charge?

5. How are citizens rewarded for their expenditures of money for public health? Name some of the more important conquests made by public-health workers.

6. What are some of the major health divisions of the Federal government?

7. Name at least three important health activities of each.

8. Who was responsible for the passage of the Pure Food and Drugs Act? What benefits have we derived from this law?

9. In what manner are epidemics of typhoid, smallpox, and diphtheria prevented? What local health agency protects your community against these diseases?

10. Why are immigrants given a medical examination before entering our country? Who is responsible for safeguarding the public health?

11. What percentage of the city's budget is spent for public health? Is this fact known to your public-spirited citizens?

12. Why are hospitals maintained by the Federal government? For whom are they maintained?

13. How may the individual citizen contribute to the health of the community?

# CHAPTER XXVI

## A HEALTHFUL WATER SUPPLY

**382. In ancient times.** The Romans were practical people. Beginning their remarkable career on the now famous seven hills, they gradually extended their conquests until they covered the Italian peninsula and swept round the borders of the Mediterranean. Where the Romans went they carried their laws, language, art, and civilization. The more we know about these stalwart people, the more we realize that their success rested in part on their healthful living.

Very early in their career they realized the necessity of having an adequate supply of pure water. One of the principal dangers threatening every supply of water is its pollution from sewage. In early times Rome's water came from the Tiber, into which the city's filth also found its way. As the Romans became skilled in engineering and as the water supply became more and more intolerable and dangerous, they began to build those remarkable aqueducts that are now considered among the wonders of the past. Great pipes made of stone and usually elevated on arches, often crossing streams and mountains, brought pure water to the city from sources many miles away. These aqueducts represented tremendous energy and expense. By the third century of the Christian Era, Rome was supplied with fourteen aqueducts varying in length from eleven miles to sixty-two and aggregating three hundred and fifty-nine miles.

Sometimes the water was made to flow through channels constructed on the top of triumphal arcades of prodigious height, exceeding one hundred feet, and composed of as many

as three tiers of arches resting one on top of the other. Each of these aqueducts emptied into a reservoir of its own, from which it was distributed through underground channels to the different parts of the city. This made possible the numerous public



FIG. 140. A Roman aqueduct

These ruins are magnificent monuments to Roman genius

fountains and public baths for which the Eternal City was famous. In the countries bordering the Mediterranean there are now ruins of at least two hundred of these Roman aqueducts. At least one of them helps to supply the modern city of Rome with water. These Roman aqueducts are among the most impressive monuments of ancient civilization.

The ancient Romans were especially noted for their remarkable baths. The baths of Caracalla were a mile in circumference and open at certain times for the free use of every citizen. They were capable of accommodating more than sixteen hundred persons at a time.

**383. Importance of water.** From the earliest times water has played an important part in civilization. Men settled only where water was available. An abundance of water made navigation and commerce possible and served other human needs. One of the most important factors involved in the founding of cities is the water supply. It is no mere accident that ancient Egypt was like a shoestring extending along the banks of the Nile. All the large cities of the world are near bodies of water.

Water is a necessity of life. It is not only necessary for the proper cleanliness of person, clothing, and environment, but it is a necessity of the diet. Seventy per cent of the weight of the body is water.

Water enters into the composition of all the tissues, is the chief ingredient of the blood and the other fluids of the body, distributes bodily heat, regulates the body temperature by providing for perspiration and evaporation, and prevents friction of the various parts. It is as necessary as air and food.

**384. Water-borne diseases.** The relation between the water supply and illness and death is very marked. The greatest danger to the water supply is pollution from human sources. All the discharges from the body find their way sooner or later into our streams, where they become a menace to life. Among the water-borne diseases are typhoid fever, cholera, and dysentery.

The discovery of the sources of great epidemics reads like a novel. One of the first epidemics which could be traced definitely to the water supply occurred in Plymouth, Pennsylvania,

in 1885. The water supply was infected by a single person, and as a result one out of every eight of the inhabitants had typhoid.

The story runs as follows: Plymouth received its water supply from a mountain brook which drained a watershed that was almost uninhabited. The stream was dammed from time to time, and the water was stored in four reservoirs. The infection was traced to a citizen who had spent his holidays at Philadelphia. On his return he came down with typhoid. His excreta were not disinfected and were deposited near the edge of the stream. The brook was frozen until spring. In March there was a thaw and the entire accumulation was swept down into the brook and finally into the water mains. Three weeks later typhoid cases appeared by the score in Plymouth. On some days there were as many as a hundred new cases. Over a thousand cases were reported, and one hundred and fourteen people died. The epidemic was limited to those houses supplied by town water and to those who drank from the public water supply. This difference

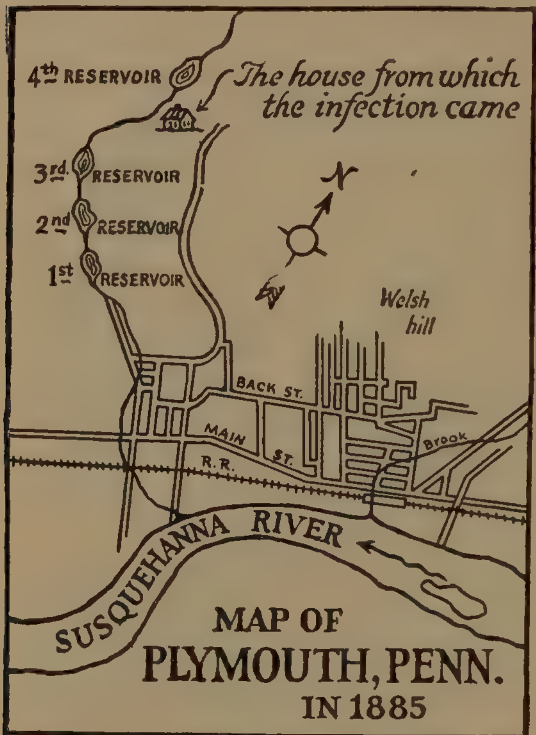



FIG. 141. This map illustrates how a water supply may be infected [1]

[1] From Preventive Medicine and Hygiene, by Dr. M. J. Rosenau. Published by D. Appleton and Company.

appeared in a very striking fashion on one street. The houses on one side, supplied with wells, had no cases; the houses on the other side, supplied by town water, had several. This shows that freezing alone was not sufficient to destroy typhoid infection. It also shows how a single individual may endanger the lives of a community.

**385. The water supply in the country.** Water in the country is generally more likely to be infected than water from city mains. People in the country are likely to be more or less careless about the source of their drinking water and the disposal of wastes. Then a city supply is likely to be frequently tested, and many precautions are taken to protect it from contamination. The sewage is usually disposed of by the most modern scientific methods.

Water supplies may be divided into two classes: surface waters and ground waters. The surface waters come from streams and lakes, and the ground waters from wells and springs. Surface waters are used by municipalities but are seldom used by single houses. Most people in the country take their water from springs or wells. Wells are most common.

Wells may be divided into two classes: dug wells and tubular wells. Dug wells are usually lined with brick, stone, cement, or wood. The joints between the parts of such lining are seldom water-tight so as to shut out surface water. The coverings of wells are often made of boards with little or no attempt to keep out rain water or splashings when it rains. This means that the filth that is tracked on the platform of the well is washed through the cracks. Most wells admit polluted surface water. A fair degree of protection may be given to a dug well by placing concrete round the well lining for several feet below the ground and by building over it a tight concrete cover; but even when such precautions are taken, it is likely to be less safe than a tubular well.

Fortunately the open well equipped with chain pumps or buckets is fast disappearing. The "old oaken bucket" sounded well in song and story, but in the light of modern hygiene and sanitation it suggests anything but health. Such a well was accessible to dirt blown by winds and encouraged the handling of the chain, rope, or bucket. If the person who drew up the water always had clean hands, it would be a different matter; but who ever heard of one's washing his hands before drawing water from a well? It is not unusual to find in open wells dead leaves, frogs, mice, and sometimes a dead cat.

It is fortunate also that in both country and town there is now a marked tendency toward drilled or driven wells. Either of these tubular wells is a protection against the entrance of leaves, dirt, small animals, and surface water. Care should be taken to see that the ground is firmly packed against the pipe to prevent the seepage of surface waters and that the connection between the pump and the well tube is water-tight.

Springs are always a questionable source of drinking water in spite of the generally accepted idea of their reliability. Investigation shows that a spring is little more than a shallow well that flows. In some cases the water from a spring may come from a great distance and a considerable depth. Most springs are likely to be supplied by rain water which has percolated through a loose sandy soil to an impervious layer of clay or rock and then found its way to some soft spot where it comes to the surface as a spring. In a primitive community that was sparsely settled there was little chance of contamination; but as soon as population increases, with its barns, pigpens, outhouses, and cesspools, the soil may become so polluted that poisonous wastes may contaminate the spring. Sometimes the shallow ground water may be washed over the surface directly into the spring.

**386. Bacteriological analysis desirable.** If water has a pleasant taste and is clear and cold, it is too frequently called safe

and excellent drinking water. Experience shows that water may pass these tests with a very high rating and yet be dangerous. On the other hand, it may fail conspicuously to meet these tests and yet be perfectly safe. Temperature, clearness, and agreeable taste are usually in the mind of the person who says, "I have the best well of water in the state." Usually he has no scientific background for such a statement. The germs that cause disease are too small to be seen and have no taste or smell. They may live either in cold water or in warm water.

The only way to be sure of the safety of a water supply is by means of a bacteriological analysis. Most state departments of health make such examinations free. If you wish such an examination write to your state department of health, which will send you containers and a questionnaire to make out. It is often desirable to have bacteriological analysis of the water supply when one moves to a new place or when there is illness in a family from a disease that may be water-borne.

**387. A survey of roadside water supplies.** In an age when vacations and automobile trips are becoming increasingly popular the safety of the water supply is tremendously important. In the summer of 1924 the Pennsylvania State Department of Health made a survey of roadside water supplies for the purpose of informing the traveling public where safe drinking water might be found. The results of this study could probably be duplicated in any other state. The survey was made, with the help of the main office, by an engineer, a bacteriologist, and a food specialist traveling by automobile. More than two thousand miles were covered along important highways. Twelve hundred water supplies were inspected. Samples of water were taken from dug, driven, and drilled wells and from springs, streams, and cisterns. Of the total number of roadside water supplies investigated, only 34 per cent were finally approved. Only 38 per cent of the dug wells were approved, but 80 per cent of the drilled wells were satisfactory.

Such a survey shows how dangerous it is to assume that all drinking water in the country is safe. It also illustrates how a wide-awake health department may protect the health of its citizens.

**388. How to choose a place from which to drink.** In consideration of facts such as have been cited on previous pages, Mr. C. E. Rich of the Michigan State Department of Health gives this advice on choosing a country drinking place:

> First, I would say, carry one or more thermos bottles and fill them from the public municipal supplies in the cities you pass through. These waters are under the constant supervision of the local officials as well as of the State Department of Health, and most of them are safe for drinking.
>
> Second, do not drink from a stream if you can possibly avoid it, and then only if in a region which is almost entirely uninhabited.
>
> Third, if you must drink from a country well, examine the surroundings very carefully. If the yard is untidy, if either barn, pigpens, chicken houses, or a privy is near the well, or if it appears that the surface drainage is toward the well, go on to another place.
>
> Fourth, do not drink from a well simply because it is recommended by the owner. He will probably tell you that he and his family have used the water for many years and have never been sick. This may be true, but that is no guarantee that the same will happen to you. It is entirely possible for a person to drink contaminated water and develop an immunity to the water-borne diseases, and this may have been the case with the owner of the well and his family.
>
> Fifth, do not drink from a spring unless you are in a very sparsely inhabited country and then not if there appears to be any possible source of contamination in sight.

A sixth suggestion might well be added; namely, that if a suspicious water supply must be used, the water should be boiled or possibly treated with hypochlorite of lime. Another good method is to put a drop of iodine into a quart jar of

water. In about twenty or thirty minutes the water will be ready to drink. This chemical treatment kills typhoid germs and other germs that cause disease.

**389. Sewerage problems in rural and village communities.** The problems relating to sewerage are reduced to a minimum in our best-regulated cities. The city sewer systems carry

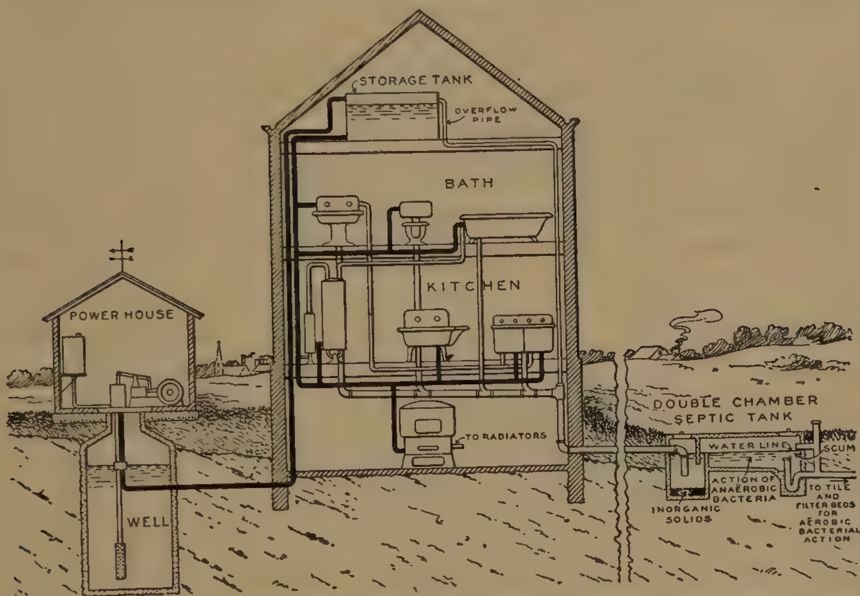



FIG. 142. Diagram of a modern country house, showing the conveniences provided in an ordinary city home

wastes to a remote distance from the homes. The individual householder has almost no responsibility in the matter. In rural and village communities the situation is the reverse. The community as a whole attempts little or no service or control. Every family must exercise intelligence in regard to such matters in order to be healthy themselves and to protect their neighbors. One of the most pressing health problems of rural communities is the disposal of wastes.

**390. Dangers from human excreta.** The excretions from our bowels and kidneys are often the source of great danger.

Such excretions often contain the living poisons, or germs, of disease. These germs may come not only from persons sick with disease but also from people who are apparently in good health, the so-called carriers of infection. If human waste is not disposed of in a sanitary manner, it may get into the water we drink, the food we eat, or on the skin of our bodies, and so carry to us the germs from the bodies of infected persons. Typhoid fever, dysentery, Asiatic cholera, tuberculosis, round worms, pinworms, tapeworm disease, and hookworm disease are all spread through human excreta.

There are three important ways whereby excreta may be scattered. One of these is through surface washing or subsoil seepage. This has already been referred to in connection with the water supply.

Contaminated water may spread disease by infecting the drinking water. Such water may also convey infection by being used to wash foods or vessels used for storing foods. Milk vessels are especially important in this connection.

A second method is through persons and animals. Poultry, dogs, cats, rats, or people may walk over soil polluted with human excreta, get filth on their feet, and then track it to the top of the well, to the bank of the spring, the house, or the yard where the children play. Carelessness in not washing the hands after visiting the toilet is one of the most important sources of infection.

Flies and other house insects breed in and feed on human waste. It is easy to understand how flies contaminated with filth are likely to crawl over food and dishes or to fall into milk, and so spread filth.

No home or community is well started in healthful living until it has safely disposed of its wastes.

It has been found that the number of plumbers, gas fitters, and steam fitters to each million of our population has changed from 209 in 1870 to 1956 in 1920, an increase of 577 per cent.

In part this is due to the adaptation of modern plumbing to good water supply and modern sewage disposal, two things that are largely responsible for the gradual disappearance of typhoid from our communities.

**391. Disposal of human waste.** One of the most common and usually one of the most unsatisfactory methods of disposing of human excreta is by means of the pit privy. This may be described as a hole in the ground over which an outhouse is built and into which the excreta are deposited. When the pit is filled, the privy is sometimes moved over a new pit and the old pit is covered up. Sometimes the house is not moved, but the wastes are removed and buried. Such a privy when properly constructed and used offers protection against flies and domestic animals. Often, however, it is not built to exclude flies or is used so carelessly as to be a center of menace from them.

One of the greatest dangers from the pit privy is the possibility of infecting the water supply. This is particularly true in limestone regions and in marshy soils. It should never be located within at least one hundred yards of a well or on a slope above a spring. The use of drying powders, lime, sand, and disinfectants will tend to lessen the dangers of a pit privy. A privy may be made even more safe by providing a water-tight and insect-proof receptacle for the reception of excreta. This will keep out flies and prevent the pollution of the water supply. Privy contents may be disposed of finally by burial.

Even when operated so as to protect against flies and reasonably well against infection, pit privies are not to be recommended. At best they are inconvenient and likely to be dangerous because of possible carelessness.

According to United States Public Health Bulletin No. 68, "Health Service," a sanitary privy "should be so constructed that it will afford privacy and comfort to the user. It must have a water-tight receptacle (pail, can, tub, barrel, tank, or

vault) to receive the excreta. This receptacle must be so protected as to prevent access of flies or domestic animals to its contents. The receptacle must be so arranged that it may readily be removed for cleaning or easily cleaned in place."

The building should be kept in a good state of repair and its contents be properly disposed of. The last point is especially important.

The bulletin quoted above says that privies may be so constructed that final disposal occurs automatically through pipes which carry the overflow to the subsoil in such a way as to be safe or relatively so; or the receptacle can be large enough (as a vault) so that it need not be emptied more than once a year; or it may be made large enough (as a barrel) so that it need not be emptied more than once a month, if the family is not too large; or it may be of a size (as a pail) that requires emptying every week or every day according to the circumstances.

One of the most hopeful signs of healthier living is the improved water supply and the installation of modern sanitary bathrooms in rural and village communities. When there is no city or town water supply available, house owners often construct tanks in their attics. These may be filled by hand pumps or gasoline engines. Such attics make it possible to pipe running water to a bathroom or to any part of the house. Sewerage pipes dispose of the wastes.

Continuous running water from a hillside spring has been a feature frequently found in New England farmhouses from of old; Thoreau, for instance, tells how he found it when he went to a region more mountainous than Concord. It ought to have been more utilized to give the conveniences of plumbing. An obstacle may have been the fact that the stream could not protect itself against freezing by its rapid flow if it was divided to many places in the house, so that heating

through the night would have been necessary in the coldest weather; but much of the failure to utilize it must have been due to failure to appreciate the opportunity.

Since so many city people today spend several weeks or months in the country every year on their vacations, the question of water supply and sewerage in rural districts becomes a vital matter to them.

**392. Sewage disposal.** In a closely built-up area such as we find in cities privies should not be tolerated. Statistics show that the substitution of sewage systems has reduced the death rate in many cities. Dr. George C. Whipple of the Harvard Engineering School says, "In Munich when sewers were constructed in 1856–1859 the typhoid-fever rate fell from 242 to 166 per 100,000; later, after an improved water supply and other sanitary reforms had been brought about, the typhoid-fever death rate fell to a much lower figure."

We are so used to the general sewerage system in our cities that we do not realize that this is rather recent in its origin. It dates back to the middle of the last century.

Until recently one of the most common methods of sewage disposal was to allow the sewage without treatment to flow into the nearest lake or stream. When the dilution is sufficient this may be satisfactory. The disease bacteria are killed by other organisms, by sunlight, or by other natural means. The farther this polluted water is from its source of contamination, the less dangerous it is. Typhoid bacilli do not multiply in water. After a week usually not more than 10 per cent will remain alive; after a month, not more than 1 per cent. Nevertheless a city that gets its water supply from the river on which it stands may find its supply contaminated by a stream above. Oyster beds are sometimes contaminated by sewage.

Usually sewage now undergoes treatment in filtration plants before it is allowed to drain into a public stream. This treatment destroys the bacteria and dissolves the organic material.

This chemical treatment is sometimes accomplished by adding lime, iron salts, alum salts, or acids. Sometimes the sewage is filtered so that it is supposed to be impossible for bacteria to pass through. In both America and Europe there has been some successful experimentation in using sewage for fertilizer.

FIG. 143. Croton Falls diverting dam and reservoir

This body of water is the source of a city's water supply. The dam raises the water to a level where it can be diverted into the main reservoir

**393. A sanitary achievement for San Francisco.** The romance of securing a supply of pure water is not limited to ancient Rome. The stories of modern times are equally thrilling, and because of our greater scientific knowledge the drinking water is much safer from infection today than in ancient times.

The story of how San Francisco secured its water supply is one of achievement. San Francisco is located on the point

of a peninsula with salt water on the north, east, and west. There was water, water everywhere, but scarcely a drop to drink. Because of its great harbor (the best one on the Pacific coast) San Francisco seemed to be the natural site for a large commercial city, but this was impossible unless a large amount of fresh water was available. With the increasing demands of a rapidly growing city it was necessary to go farther and farther inland for the water supply. Much of this is now secured from the Hetch Hetchy valley, one hundred and forty-five miles east of San Francisco, at an elevation of

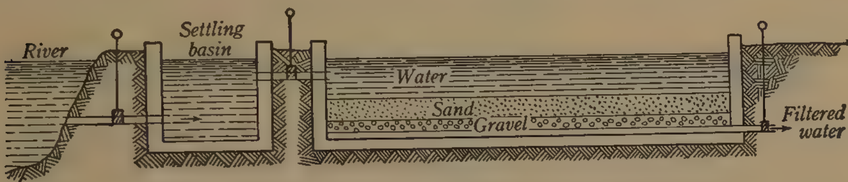



FIG. 144. The arrangement of a slow sand filter

thirty-five hundred feet. The aqueduct route from Hetch Hetchy to the city penetrates the western part of the Sierra Nevada range, crosses the San Joaquin valley, then passes through a second range of mountains (the Coast Range), then goes underneath San Francisco Bay, and finally reaches the city by way of the peninsula. The distance along the line followed by the aqueduct is one hundred and sixty-eight miles long. The whole is a triumph of engineering skill.

**394. Guarding the source of the water supply.** After a water supply is available it is often a serious problem to insure its being delivered to the consumer uncontaminated. Usually the watershed tributary to the reservoir is sparsely settled. Ordinarily no habitations are allowed within five miles. Caretakers are employed permanently to see that the water is not polluted, and the area is well policed. No human excrement, garbage, or other refuse is allowed to be placed in the reservoir or within several hundred feet. Sewage from

permanent camps, hotels, or dwellings must be filtered, or otherwise purified, and destroyed. Care must be taken to provide water-tight pipes which will carry the water from the reservoir to its destination without danger of pollution.

**395. Filtering the water.** Usually before the water is turned into the city mains additional precautions are taken to protect the consumer against infection. The water may be filtered. There are two well-known methods of filtration. One is called slow sand-filtration to distinguish it from the rapid process, known as mechanical filtration.

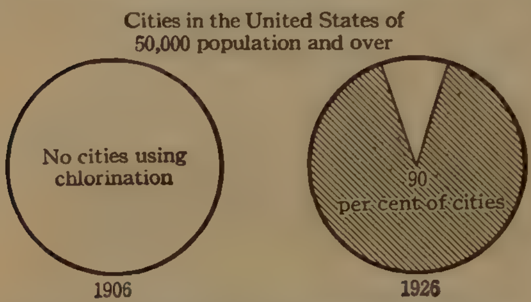



FIG. 145. Most cities throughout this country have made their drinking water safe by chlorination

The process of slow sand-filtration is an imitation of nature's method of purifying water. It was noticed that when water passed through sand it tended to be purified. The imitation of this process began even before the chemistry or the bacteriology of the process was understood. Now cities have at great expense constructed filter beds of sand to purify the water. In Washington, D. C., twenty-one acres are required for filter beds, which furnish sixty-three million gallons daily. A filter bed is very much like an ordinary reenforced concrete reservoir. The bottoms and sides must be water-tight to prevent pollution. Each filter bed may occupy an acre of space, and is independent from other filter beds so that it may be cleaned and regulated without disturbing the other beds. Trained engineers and bacteriologists are constantly at hand to see that the filtering plant operates at a high grade of efficiency. Frequent tests are made of the water from the different beds. From time to time the old sand must have a layer scraped off and finally it

must be entirely removed. After the sand has been thoroughly washed and disinfected, it may be used again. The usual thickness of the sand layer varies from twelve to forty-eight inches. This method of filtering is so efficient that 99 per cent of the bacteria are held in the upper layer of the sand. The introduction of slow sand-filtration had in many cities

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FIG. 146. An ingenious method of improving the taste of water supply by aërating it with oxygen at a filtration station

an immediate effect in lowering the death rate of water-borne diseases, such as typhoid fever. Many health authorities believe that this method has also resulted in a reduction of the general death rate.

In mechanical filtration chemicals are added to the water to make it clear and to kill bacteria. The water is forced rapidly through beds of sand. Adding chlorine to the water is one of the common methods. Many cities use both filtration and chlorination. Through such scientific methods water from city mains is practically 100 per cent safe.

One of the latest and most interesting ways of sterilizing water is by the use of ultra-violet rays. These may be supplied by a mercury-vapor lamp. By an ingenious arrangement the water is exposed to the rays in such a way that when the light goes out the water stops. The bacteria are killed when exposed to the rays for a few seconds. This method is cheap and reliable and may receive more attention in the future.

Ultra-violet rays have been effectively used in disinfecting water in swimming pools. Pools frequented by many people are certain to be contaminated. This may be overcome in part by changing the water frequently and by allowing only people free from contagious disease to bathe, and then only after taking a shower bath. The water at a bathing beach is harder to regulate.

**396. The ice supply.** It was not suspected that ice might convey disease until it was discovered that typhoid and other germs were not killed by freezing. Sedgwick and Winslow in 1902 made one of the first reliable studies in the laboratory. They discovered in the case of the typhoid bacillus that 50 per cent of the microbes died by the end of the first week, 90 per cent by the end of the second week, and practically all at the end of twelve weeks. Investigation shows that bacteria are more common in "snowy" and "bubbly" ice than in clear ice.

Today we use natural and artificial ice. Natural ice should be taken from water of good sanitary quality and be handled in a cleanly way. Even if the water is polluted the danger is reduced, because water purifies itself in freezing. It also remains in storage for several months before being used.

Ice is now manufactured by the ammonia process. Ammonia in condensing requires heat, which it takes from objects near it. In this way heat is taken from the water, which then freezes. Artificial ice should be made from pure water. Even

then, if there is uncleanliness in the manufacturing plant, it may contain more bacteria than the water from which it is made. The modern electric refrigerator makes it possible for the housewife to make her own ice under sanitary conditions subject to her own control.

Either natural or artificial ice is reasonably safe if it is not contaminated in handling. Contamination may take place because the ice is drawn over dirty sidewalks or handled by people who have dirty hands. The clerk at the ice-cream counter who puts ice into the lemonade with his bare hands is guilty either of ignorance or of criminal negligence.

### *For Informal Discussion in Class and at Home*

1. Look up additional facts about the way the Romans secured their water.

2. Consult histories and encyclopedias for further information about the Roman baths.

3. What diseases may be water-borne? Consult the reports of your state department of health for evidence of water-borne epidemics.

4. How does the problem of pure water in the country differ from that in the city? How is this problem to be solved in the country?

5. Find out all you can about your local water supply.

6. What precautions should the automobilist take to secure a safe supply of drinking water?

7. How does your city or town take care of its sewage? How is this problem met in a rural community?

8. How may disease be transferred through ice? Discuss preventive measures in detail.

9. Write to the Bridgeport Brass Co., Bridgeport, Connecticut, for a free copy of their booklet, "The History of Sanitation." Report to the class on such topics as "When Plumbing took a Thousand Years' Vacation."

## CHAPTER XXVII

### A HEALTHFUL MILK SUPPLY

**397. Milk as a food.** The problem of supplying a community with milk is one of the most important of health problems. Milk is our best single food, supplying almost every element necessary for growth and energy. It is a protective food, guarding against deficiency diseases when used in combination with other foods. About 16 per cent of the average dietary in the United States consists of milk and milk products. Since milk is so necessary in the diet of infants, there is always suffering when the supply fails.

In contrasting milk-drinking peoples with others, Dr. McCollum says that such people have "attained greater size, greater longevity, and have been much more successful in the rearing of their young. They have been more aggressive than the non-milk-using peoples and have achieved greater advancement in literature, science, and art. They have developed in a higher degree educational and political systems which offer the greatest opportunity for the individual to develop his powers. Such development has a physiological basis, and there seems every reason to believe that it is fundamentally related to nutrition."

**398. Milk easily contaminated.** The fact that milk is in a liquid form and is such a good food makes it also a dangerous food at times. Bacteria readily thrive in it. That is one of the chief reasons why it is responsible for more sickness and death than any other food. Among the diseases spread by milk are tuberculosis, typhoid, scarlet fever, diphtheria, the foot-and-mouth disease, and septic sore throat. The summer

complaint of children and the diarrheal diseases among adults are often due to infected milk.

The long journey that milk may take before it finally reaches the consumer makes its contamination easy. It frequently reaches the consumer only after several hours of travel during which it has been exposed to dirt and dust and to containers and handlers that are not scrupulously clean.

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FIG. 147. Bottling cream in a sanitary dairy

The importance of milk as a food and the dangers to which it may be subjected make the regulation of the milk supply one of the most difficult health problems of a community. The remainder of this chapter will concern itself with the best methods that have been worked out to insure a sanitary milk supply.

**399. Healthy cows the first essential.** Milk at the point where it passes from the udder of the healthy cow is practi-

cally free from bacteria. Those that are found are harmless, but even these multiply very fast. If the milk at the time of milking is contaminated with disease bacteria, then by the time it has reached the family table it has become a real source of danger. For this reason the healthy cow is the first essential.

The chief danger from unhealthy cows is tuberculosis. Bovine tuberculosis in man is practically never responsible

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FIG. 148. Healthy cows in a sanitary stable

for tuberculous infection of the lungs. In man it is a disease of the bones and lymph glands. The infection starts in the small intestine. From a quarter to a third of all tuberculosis in children under five years of age is bovine in origin. Fatalities from bovine tuberculosis are rare after the fifth year. About 5 per cent of the deaths due to tuberculosis are of bovine origin. Health experts are agreed that most of the infection from bovine tuberculosis comes from cows' milk. There is little danger from meat, because it is usually cooked and tuberculosis of the muscles is rare.

Bovine tuberculosis may be prevented by using milk, cream, and milk products from healthy cows. Fortunately there is now a reliable tuberculin test for cattle. Milch cows should be tested at least every six months. According to the standard milk ordinance for many states throughout the United States every diseased animal is to be removed from the herd at once and no milk from diseased cows is to be offered for sale. The animals that fail to pass the test are branded with T or TB and are slaughtered under the direction of the health officer. Many states are now passing legislation looking forward to the prevention of bovine tuberculosis in man. In some states the farmer is reimbursed for the loss of diseased cows.

At the present time evidence continues to accumulate to show the value of the recently discovered Calmette vaccine for producing specific immunity in cattle against tuberculosis. It seems probable that we have in this vaccine a method of protecting cattle which might well be substituted for our present costly and ineffective procedure of testing and slaughtering. On some farms where this vaccine has been used it was found that calves that were inoculated with this vaccine during the first fifteen days of life and revaccinated every year did not contract tuberculosis, although they were in a herd of tuberculous cattle.

**400. Health certificates for dairy employees.** Most diseases have their primary sources in man himself. Every person who is ill or is a carrier of disease may infect any kind of food with which he comes in contact. The milker who is unclean in his habits, the bottler, the deliverer, — anybody, in fact, who has anything to do directly with the milk supply, — may be a means of spreading disease.

The literature on this subject is voluminous. We shall refer to only two epidemics. On April 29, 1924, four cases of scarlet fever were reported in the city of Helena, Montana. Three were boys between six and eight years of age and one was

a girl eighteen years old. The cases were found in widely separated parts of the city. The boys came from different schools. The girl did not attend school. Under such circumstances it seemed improbable that the disease had been spread by contact. Further investigation showed that all four of these cases were supplied with milk by the same milkman. Samples of the milk were immediately examined at the laboratory of the state board of health. Organisms were found which were identical with those found in cultures made from the throats of some of the cases. Visitation at the dairy and an examination of those who came directly in contact with the milk showed that previous to the outbreak one of the employees had had a moderately severe sore throat which had persisted for several days. Distribution of milk from this dairy was immediately stopped, and the epidemic subsided. At Intermountain College, which was supplied by this dairy, there were sixteen cases. As a result of this infection by one worker, there were in all fifty-five cases of scarlet fever.

The notorious outbreak of typhoid in Montreal in 1927, with over five thousand cases, was traced back to a typhoid carrier. Poor pasteurization was also held responsible for the spread of the disease. As a result of such experiences there are laws in some states and municipalities requiring every worker who comes in regular contact with milk during its production or distribution to have a certificate from a health officer testifying that said person is free from tuberculosis, is not a carrier of typhoid, and is otherwise free from any disease which may be spread through milk supplies.

**401. Careful milking.** Milking by machinery is the most sanitary method if the equipment is kept clean. The ordinary method of hand milking, unless it is carefully safeguarded, easily results in contamination. The habits of the milker are of great importance. The careful milker sees that the flanks of the cow are free from visible dirt at the time of milking and

that the udders and teats are sponged and cleaned with a disinfectant immediately before milking. Much of the contamination may come through the condition of the milker's hands. The hands should be washed, rinsed with a disinfectant, and dried with a clean towel just before milking. The careful milker wears clean outer garments during milking. Milk stools are kept clean. The hooded milking pail with an aperture about five inches in diameter is to be recommended. This pail protects the milk from dust and dirt. The careful milker avoids coughing and sneezing, so as not to contaminate the milk. Each pail of milk should be removed at once to the milk house for straining; it should never be strained in the dairy barn. Milk needs to be cooled as promptly as possible; within an hour after milking it should be as low as 50° F. and remain at approximately that temperature until delivered. Capping should be done preferably by machinery. Caps should be kept in dust-proof containers. If capping is done by hand, the hands should always be disinfected.

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FIG. 149. An electric milking machine

**402. Sanitary buildings and equipment.** The barns for cattle should be sanitary in order to keep the cows in good health and the milk uncontaminated. They should be well lighted and provided with air space. There should be about five hundred feet of air space per cow. The floors should be constructed of concrete or of some other material which is impervious and easily cleaned, should be made to drain properly,

and should be kept clean and in good repair. The walls and the ceilings need to be whitewashed once a year or painted once in two years. Yards for cows should be graded and well drained. Manure should be removed, or stored so as to prevent the breeding of flies.

The milk should be kept in a separate room used only for handling and storing it. In the best dairies such a room is kept scrupulously clean.

Only sterile containers should be used. This applies to milk pails, strainers, cans, or any object with which the milk comes in contact. Containers should be thoroughly scrubbed and rinsed after use. In all modern dairies they are thoroughly sterilized with steam, and care is taken that the sterilized surface which will touch the milk is not in any way handled so as to permit infection; bottles are filled and capped by machinery so that they are not touched by human hands.

**403. Pasteurized milk the only safe milk for general use.** After all the precautions suggested in the previous pages have been taken to insure a safe milk supply, there will still be elements of danger. At the present time it is impossible to expect all the cows to be tuberculin-tested. There will always be some careless people handling milk. Even with the frequent physical examination of such people some of them will get ill and infect the supply.

Modern sanitary science has fortunately found a way of making all milk reasonably safe. Over sixty years ago Pasteur discovered that heat killed bacteria, hence the term "pasteurization." As a result of various experiments it was discovered that when milk was heated to a certain degree and kept at that temperature for a certain length of time, the heat destroyed the viruses of tuberculosis, typhoid fever, scarlet fever, diphtheria, and other common diseases of man. Now practically all our large cities require the pasteurizing of milk. This means that the milk is heated to about

143° F. for a period of thirty or forty-five minutes. It is then promptly cooled.

Milk pasteurized in this way does not change in odor, taste, or digestibility, nor does the process interfere with its food value. Pasteurization does tend to reduce its antiscorbutic property, but this is not very active even in raw

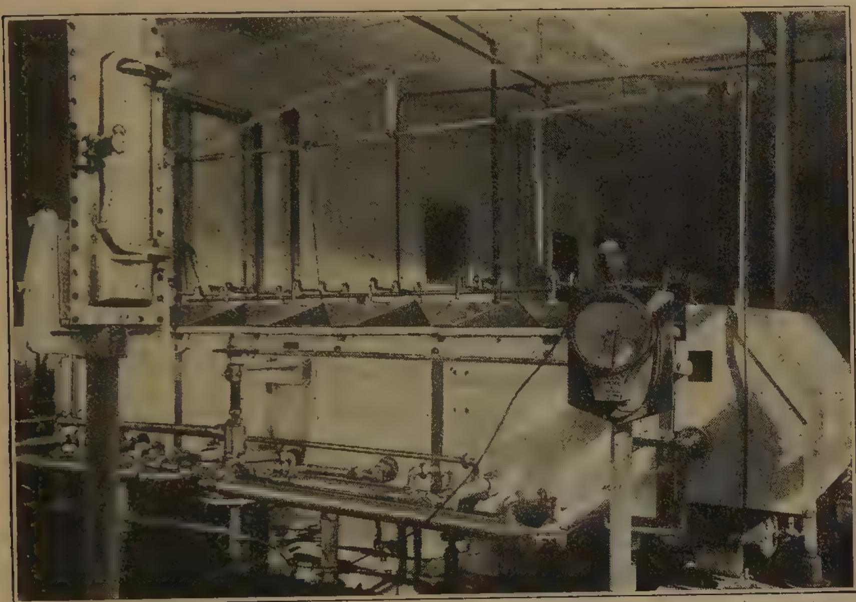

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FIG. 150. A pasteurizing machine on one of the big dairy farms that supplies New York City

milk. The antiscorbutic property of milk depends on the feed of the cow and the freshness of the milk. Child-health specialists practically all recommend pasteurized milk. Whether children are fed pasteurized milk or not, they should be given orange juice.

Pasteurized milk should be handled with the same care as raw milk. It is just as liable to infection through careless handling. The lactic acid bacteria which sour the milk are not destroyed by pasteurization. The delivery of high-grade

milk on the doorstep, hallway, or dumb-waiter does not insure that the milk will remain high-grade. To let a bottle of milk stand in the early morning sunshine for an hour or two may cause the number of bacteria to increase enormously and thus make it far less wholesome, especially for children.

Pasteurization of milk has resulted in an immediate decline of the death rate, especially among children. In New York City, Nathan Strauss was a pioneer in popularizing the use of pasteurized milk. He distributed milk free to children in parks and recreation places.

**404. Different grades of milk.** In most city markets today it is possible to buy different grades of milk. Through such grading the purchaser may have certain definite information about the milk he is buying and the careful dairyman may demand more for his product. Among the most common grades are those known as grade A, grade B, grade C, and certified milk. According to the Commission on Milk Standards of the New York Milk Committee these may be described somewhat as follows:

Grade A milk, if unpasteurized, should come from cows free from disease, and be handled by persons also free from disease, as determined by experts. The milk should be produced under sanitary conditions and should contain at the time of delivery no more than 10,000 bacteria per cubic centimeter.

If grade A milk is pasteurized, it should be produced and handled under similar sanitary conditions, so that the bacterial count at the time of delivery to the consumer shall not exceed 200,000 per cubic centimeter. Such milk shall be pasteurized under some official supervision.

Milk of grade B class shall be produced under such conditions that the bacterial count at no time shall exceed 1,000,000 per cubic centimeter. All grade B milk must be pasteurized under official supervision.

Grade C milk shall come from cows free from disease and

shall include all milk produced under such conditions that the bacterial count is in excess of 1,000,000 per cubic centimeter. Whenever any city finds it necessary to permit the sale of grade C milk because of the length of haul or other conditions, the New York Milk Committee recommends that *its sale be limited to cooking and manufacturing purposes.* All milk of this class should be pasteurized.

Certified milk is raw milk of the highest quality. It is uniform in its composition and is produced by the most sanitary methods according to the requirements of the American Association of Medical Milk Commissions. A medical milk commission is appointed by a county medical society and acts under its direction. The utmost care is taken to produce the best possible raw milk. For the production of certified milk the buildings for the dairy and stables must conform to the best sanitary standards, the herd and the milkers must be healthy, and the milk must be prepared and shipped to the consumer with the greatest care. The milk must be bottled at the source of supply. Certified milk is inspected frequently. If the bacterial count exceeds 10,000 per cubic centimeter for a certain period of days, its certification is suspended. Because of the expense of producing certified milk, its use is confined largely to children and invalids.

**405. The future milk supply.** The future of our milk supply offers a field for interesting speculation. There are no immediate indications of shortage in spite of the increased per capita consumption of milk, but with the increase of population the time is coming when not only milk but other food supplies will need to be conserved for the nation's use.

The future milk supply is likely to be in concentrated form, because milk of this type (for example, powdered milk) has many economic and sanitary advantages. At present less than 4 per cent of the approximately thirteen billion gallons of milk used annually in this country is in concentrated form;

but figures compiled by the United States Department of Agriculture indicate that the consumption of evaporated, condensed, and dry (or powdered) milk is increasing rapidly. Inasmuch as whole milk is about 87 per cent water the economic saving in transportation of a reduced water bulk is obvious and offsets the cost of condensing and drying.

Since high temperatures must be used in the concentration process, the milk is safe — a characteristic not always found in whole-milk supplies. The heating does not affect the nutritious qualities of these different forms of concentrated milks. The modern practice of using fresh fruits and fresh vegetables in the diet replaces vitamin C, which is destroyed in evaporated milk and diminished in condensed and dried milk. Heating has one other advantage, that of making the milk much more digestible. Convenience, cleanliness, stability, and nutritional qualities should cause forms of dried milk to find a definite place in the public diet. We may expect its consumption to increase steadily.

An interesting source of supply other than cows' milk is goats' milk; because of its similarity to mothers' milk it is becoming more and more popular as a food for babies.

**406. A system of licensing and inspection.** No community, especially no large community, can expect to be assured of a sanitary and satisfactory milk supply without a system of inspection and licensing. Dairies must be regularly inspected. Those that are not conducted in a sanitary way should not be allowed to market their product. Dairies need to be licensed. Milk on the market should be subject to frequent inspection. Such inspection rigidly carried out determines the amount of fat, the solid content, and the bacterial count. Unfortunately in many communities milk is sold without being subjected to bacteriological inspection. Since disease may be spread through any of the milk products, such as ice cream and butter, these foods should also be inspected.

**407. The rural and village milk supply.** In many rural communities where nearly every farmer produces his own milk there is no community milk problem. Since the family supply is not transported and is consumed soon after milking, the danger of infection is greatly reduced. However, even when the householder is so fortunate, the milk may be contaminated. Healthy cows, sanitary cow barns, care in milking, and clean utensils are indispensable.

In village and town communities where there may be no pasteurization and little or no dairy inspection, the milk supply may be at times quite unsatisfactory. This may be corrected by an intelligent and wide-awake community which wishes cleaner and better milk and is willing to pay for it.

### *For Informal Discussion in Class and at Home*

1. Why is milk so important as a food?

2. How may it become contaminated?

3. Visit a dairy which supplies your community. Do its methods of milk production conform to the standards proposed in this book?

4. Describe the process of pasteurization. Why is it important?

5. Is the individual in the village or the city better protected against infection through the milk supply? Why?

6. What is bovine tuberculosis? How may we be protected against it?

7. What grades of milk are sold by your milkman? What standards are required for each grade?

8. How may milk become contaminated after it has been bottled?

# CHAPTER XXVIII

## THE CHOICE OF A HEALTHFUL OCCUPATION

**408. The importance of a wise choice.** Some children when they reach high-school age have some definite idea of what their life's work is going to be; the majority, however, do not make up their minds until after they have completed their high-school course. The selection of a profession, occupation, or business pursuit is probably the most difficult problem that confronts not only the high-school student but the college student as well. It is a difficult decision to make. It depends on many considerations: one's individual capacity, aptitudes, physical health, and, in many instances, economic needs. Very frequently success in a career will depend largely upon the proper selection of the work to be undertaken. A good start, and the race is half won.

No student should select an occupation without consulting persons who are in a position to advise. In the old days little thought had to be given to the question of choosing an occupation, because boys usually followed in the footsteps of their fathers. In those days the activities of women were limited to the home, and this obviated the necessity of selecting for girls fields of endeavor outside the home. Nowadays, with business as diversified and professions as specialized as they are, and with the advent of the automobile, extensive railroad systems, the airplane, and other modes of conveyance, fields of endeavor have multiplied and spread to the four corners of the earth. As a result the opportunities for success in business, in the professions, and in the industries have become great. No one should blame lack of opportunities for his failure.

Early in the high-school course boys and girls should consult with school administrators whose duty it is to confer with those who need help in the selection of an occupation, Much help may be gained by seeking the advice of leading citizens of the community. Secretaries of chambers of commerce throughout the country are in a position to give advice on this subject. Young people will often find it helpful to visit and study industrial establishments.

**409. Health factors to be considered in choosing one's life work.** An occupation should be chosen with reference to the state of one's health. Anyone with physical defects of either remediable or unremediable nature, or with a tendency to organic disorders, should consider with the greatest care the effect which a specific occupation selected by him will have upon his future health. It will be necessary therefore, before deciding upon an occupation, to undergo a complete physical examination by a careful and experienced physician, for the purpose of finding out if any physical weakness will hinder one in a particular kind of work. Should a physical handicap exist, efforts should be made to correct it at once, and one should prepare for an occupation that will not aggravate the defect.

Individuals with weak lungs should never seek indoor work, but rather should obtain employment out of doors in an effort to increase their resistance against the possibility of tuberculosis. Those with weak eyes, particularly those whose vision is liable to grow worse through undue strain, should seek employment in occupations where good eyesight is not an important or necessary requisite. Persons with weak arches or flat feet should avoid occupations where they will be obliged to stand for long periods of time. Young people with heart disturbances should seek sedentary employment, such as clerical positions, office work, secretarial work, stenography, and positions of a similar nature.

The matter of determining one's physical condition in relation to one's life work is so important that physical examinations should be made at the beginning of one's high-school course and should be repeated at yearly intervals until one is ready to begin work. Such examinations will reveal who is physically fit and who is not. Those found to be physically unfit will have ample opportunity during the four years of high-school life to overcome their physical handicaps; those with handicaps that are not amenable to treatment should prepare themselves for occupations where they will not be at a disadvantage in obtaining employment. This applies particularly to those with heart trouble, the cripples, the deaf, the blind, and those with special defects. Students frequently make the mistake of waiting until they have completed their high-school course before submitting to a physical examination. If physical defects are discovered at the end of a high-school course it may become necessary for such a student to change from the occupation he originally selected. The necessity of making a second selection results in loss of time and less training for the job. Such an unfortunate situation could have been avoided if the right start had been made originally.

In many cities and states children entering industries are obliged to pass a physical examination before they receive their working papers.

**410. General factors to be considered in choosing a life work.** Outside of health there are many things to think about in the choice of a trade or profession. First of all, there is the character of the work. So far as possible it should be interesting and suited to one's ability. One of the most enduring satisfactions of life should come from one's work. If the right choice is not made, the individual may be unhappy throughout life. The kind of community in which the industry is located is important. It should be a healthful community,

offering opportunities for wholesome recreation, education, and other necessities for family life. Business and financial opportunities vary greatly in different fields. Some are exceedingly limited; others offer inducements to those who are ambitious. Many industries offer their employees insurance benefits, old-age pensions, and a profit from the business itself. There are also marked differences in the educational opportunities presented by various industries. Many of them have schools and educational advantages for those who wish to become more proficient in their work; others offer no educational opportunities. Since recreation is so important for happy healthful living, this should be carefully considered in making a choice. Many industries today have athletic teams, tennis courts, dancing, music, and amateur theatricals. Some of them offer a vacation with pay.

**411. A survey of occupations.** Before definitely deciding upon one's life work it is desirable to get a general idea of the opportunities offered. There are, for example, the professions, the commercial and industrial occupations, mining, the various branches of farming, and so on. Fortunately there are books on this subject that the high-school student might study or read with profit. Among these are W. B. Bliss's "Your School and You," published by Allyn & Bacon; F. M. and I. K. Giles's "Vocational Civics," published by The Macmillan Company; and Gowin, Wheatley, and Brewer's "Occupations," published by Ginn and Company.

Before really starting one's life work it is desirable to get the best kind of training. This lays a solid foundation for success.

**412. Working conditions.** In choosing one's occupation working conditions need to be carefully considered. The environment in which the individual works through the best hours of the day exercises a tremendous influence on his health, efficiency, and contentment. Wholesome working conditions are conceivable in nearly every industry. In some walks of life

this is necessarily impossible; for example, the coal miner must work underground, excluded from the sunshine, and the fisherman must be exposed to storms. In most industries today increased knowledge of the science of healthful living makes it possible to provide healthful surroundings for the workers.

FIG. 151. A model sanitary factory — spacious, neat, and clean, with good lighting and excellent ventilation

It is now evident that the health of the worker is of interest not only to himself but to his employer as well. A brief consideration of desirable working conditions follows.

Those who are employed outdoors have unusual advantages in the matter of sunlight and fresh air. Since they may be exposed to undesirable weather at times, care needs to be taken to provide proper clothing. Those employed indoors are subject to the questionable conditions surrounding house living.

In some industries particularly, the lighting is a serious problem. The National Safety Council in its analysis of ninety-one thousand accidents discovered that in 24 per cent of the cases faulty illumination was regarded as one of the contributory causes. Insurance companies recognize this, since they increase the premium rates (especially in some industries)

FIG. 152. A dispensary of an industrial concern

Here workers may get first-aid treatment and other attention. (Courtesy of the General Electric Co.)

where the lighting is defective. Daylight is usually preferable to artificial lighting. The modern factory is built in the open and is so constructed that daylight penetrates to the center of the working space. Electric light is the most common form in use for artificial lighting. Whatever the kind of lighting used, care should be taken to protect the eyes from glare. The walls should preferably be nearly white, so that little light will be absorbed. The amount of window space necessarily will depend on the type of industry and on whether the windows

face the sun or not. In general, the ratio of floor space to window space should be four or five to one for factories and seven or ten to one for office buildings.

The heating and ventilating of factories should, in general, conform to the principles discussed in Chapter IV. The conditions necessary for health must be modified with reference to the nature of the industry; in the manufacture of certain textiles the air must be warm and humid. The temperature should also vary with the amount of muscular activity of the worker. Ordinarily a temperature of 68° F. is most comfortable for the workers and results in the greatest efficiency. In workshops that employ many workers or where there is injurious dust, gas fumes or, humidity, mechanical ventilation ought to be used. The exhaust system is especially good when it is desirable to get rid of injurious material in the air. The plenum system is usually installed in shops where it is necessary to modify the air by humidifying or otherwise.

Factory sanitation or industrial housekeeping refers to such important things as general cleanliness; adequate toilet, washing, and dressing facilities; proper disposal of refuse and wastes; an adequate water supply; and healthful conditions for eating. These things are necessary not only for the health of employees but also to preserve their self-respect.

The tendency in many trades and occupations is toward the adoption of the eight-hour day. Formerly the working day consisted of ten hours or even more. It has been found that the greatest number of accidents occur at the time of greatest fatigue, so that the problem of fatigue must always be taken into consideration in planning for satisfactory working conditions. It has been found by experience that with due attention to details and essential efficiency the shorter hours may be advantageous to both employers and employees without financial loss or detriment to either. When the worker becomes fatigued his efficiency becomes impaired and his work drags.

This loss, combined with the cost of power, light, and other overhead expenses for the extra time, may more than counterbalance the apparent loss of shorter hours.

In many occupations where the nervous tension is high it is advisable to establish ten-minute periods of rest several times a day. Experiments have proved that this plan has resulted

FIG. 153. A rest room for employees

in increased output, in reduced fatigue, and in fewer accidents, and has lessened turnover of labor by creating a better-satisfied workman and maintaining better health. Each workman is entitled to sufficient time for meals, sleep, and the proper enjoyment of life, as well as a standard living wage.

A proper living wage makes it possible for the workers to secure good food, provide proper housing conditions, enjoy recreation, raise a family, and save money.

In some of the industries employers make provision for periodic health examinations for workers subject to occupational and industrial hazards, medical care not only for their employees but sometimes for their families as well, and old-age pensions.

**413. The employment of women and children.** Perhaps the most important phase of the hygiene of the worker concerns the health of women and children. The greatest asset of a nation is her children. The children of today are the adults of tomorrow, and the women are the potential mothers of those who follow. The vigor and vitality of these groups must be conserved. Practices and customs that tend to interfere with education, to impair the physical, mental, or moral development of children, or to weaken their vitality must be replaced by traditions that safeguard health and vigor.

Many states have passed laws which regulate child labor; the minimum age has been placed at fourteen years. The number of hours per day and per week during which the child may work are subject to regulation. A medical certificate indicating freedom from physical defects must be presented. Night work is usually prohibited, especially for girls.

In certain states children between the ages of fourteen and sixteen must attend continuation school for a definite number of hours each week, and are limited in the number of hours of their employment.

The hours of women who are employed in exacting trades and occupations should be regulated, with reasonable allowances made for absence at certain periods. Rest rooms should be provided in all occupations.

**414. Occupational hazards and diseases.** There are inherent dangers to health and life in certain industries. Many occupations, while not in themselves particularly hazardous, are rendered so through personal carelessness. Other occupations are blamed for the worker's ill health when it is primarily

due to unsanitary home conditions and to the bad personal habits of the individual. Workmen change the place and nature of their occupation from time to time, they vary in their physical and mental vigor, and their ages and nationalities are different. These and many other similar influences have a definite bearing upon occupational hazards and health.

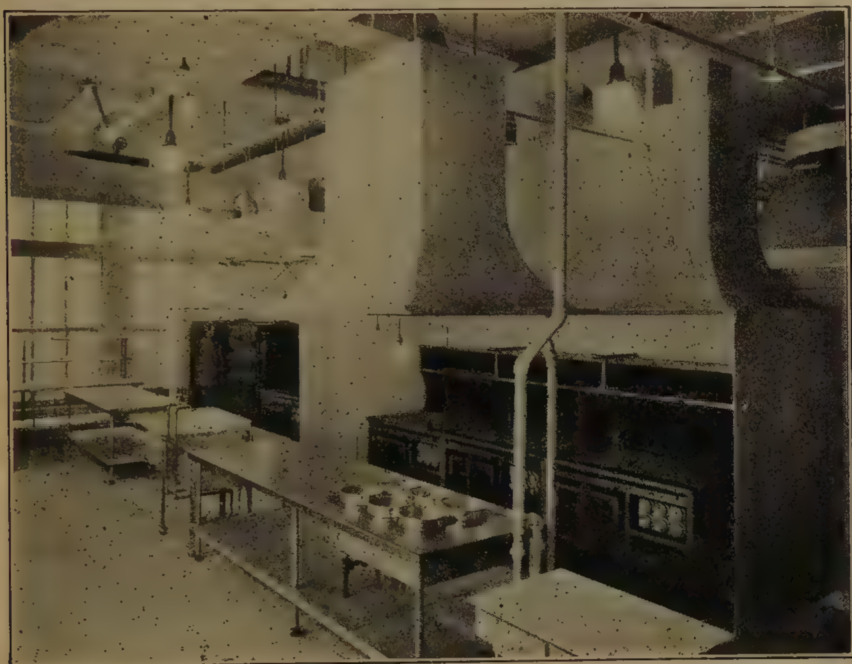

FIG. 154. A sanitary kitchen that supplies well-cooked food for an employees' lunch room

The true diseases of occupation refer only to those disorders which are contracted because of the nature of the activity, and which would not have been contracted if the individual had not engaged in that particular work. Most of the diseases of occupations are due to poisonous and irritating gases, vapors, and fumes, metals and dust, abnormal atmospheric pressures, and sudden marked changes in temperature to which workers are exposed. Industries vary as to hazards.

**415. Lead poisoning.** Lead poisoning is one of the most common of the occupational dangers. Among the branches of manufacture known to be connected with lead poisoning are smelting, tinning, pottery, glass-cutting, enameling, painting in which red and white lead are used, coach and automobile manufacturing, printing, and shipbuilding. The poisoning is caused by the inhalation of fumes and dust and by absorption

FIG. 155. This pleasant cafeteria is for the workers in a large store

of lead through the skin from handling. A blue line on the gums is a danger signal: it indicates the presence of lead in the system. Abdominal cramps, persistent headaches, and paralysis of the fingers and wrists are marked symptoms of lead poisoning.

Lead poisoning may be prevented by periodic examinations of the workers by the industrial surgeon or physician, the substitution of other materials to take the place of lead, personal hygiene, and a perfect system of exhaust ventilation for the removal of dust.

**416. Mercury poisoning.** Mercury poisoning dates back farther than any other form of industrial poisoning. It arises chiefly in the manufacture of barometers and thermometers, gilding and silvering, the separation of gold and silver from their ores, the manufacture of mercury, its use in the manufacture of explosives, and numerous other processes involving the use of mercury. The danger of poisoning from mercury arises chiefly from inhalation of the vapor and, in a minor degree, from swallowing air. In this kind of poisoning there is an excessive swelling and ulceration of the gums, a deposit over the teeth and gums, and (in severe cases) a loosening and falling out of the teeth. Among industrial workers the nervous system is frequently affected. This is known as a mercurial tremor. In cases where the muscles of the hands are involved, the fingers cannot be directed to any object with certainty.

To prevent mercury poisoning there should be proper mouth hygiene, exhaust ventilation for the removal of mercurial vapor, the use of protective outer clothing, the use of respirators, and frequent washing of the hands and face.

**417. Arsenic and copper poisoning.** Arsenic poisoning occurs in the manufacture of artificial flowers, wall papers, and children's toys. The poisoning takes place through the inhalation of air contaminated with the dust of salts of arsenic, and commonly by the inhalation of arsine, a gaseous compound of arsenic and hydrogen. Alighting on the moist surfaces of the skin, arsenic dust causes an irritation which if neglected leads to extensive ulceration known as arsenic pock, affecting the mucous membranes. We find as a result conjunctivitis and swelling of the eyelids, and hoarseness due to an inflammation of the mucous membrane of the throat. A brown pigmentation of the skin is present in those who have worked for several years in contact with arsenic dust.

The most characteristic lesion produced on the upper air passages by salts of copper in the form of dust is perforation

of the septum of the nose, varying in extent from one-eighth inch to one inch in diameter. In susceptible people perforation may be complete in a month from the time of commencement of work.

The preventive measures are exhaust ventilation, washing and bathing accommodations, periodic medical examinations, and the use of overalls and respirators.

**418. Benzene poisoning.** Enormous quantities of benzene are used industrially in the manufacture of dyestuffs and pharmaceutical preparations. Considerable risk of acute poisoning results from the substitution of benzene for turpentine in quick-drying paints. The poisoning is caused by the inhalation of the vapor. It occurs most frequently as a result of accident, such as the breaking of a distilling apparatus or a vat. In slight cases of poisoning there is giddiness and a stage of excitement. If the vapor is inhaled in quantity, coma follows.

Care should be taken to avoid accidents in handling benzene. Artificial respiration and the administration of oxygen should be used in treating benzene poisoning.

**419. Silicosis of the lungs.** Silicosis is found among stonecutters, in mining industries, and in cotton-manufacturing. It is caused by the inhalation of stone dust containing over 80 per cent of free silica. Among its symptoms are shortness of breath on exertion, diminished expansion of the chest and back, and rigidity of the chest wall. On physical examination it is recognized by changes in the lungs.

Prevention may be secured through the periodic examination of workers, the removal from the dusty atmosphere of those who show indications of beginning disease, and the use of respirators. If discovered and treated in the early stages, the fibrotic changes in the lungs will heal.

**420. Neurosis.** Occupational neurosis results from a constant repetition of the same act where the muscles concerned are subject to prolonged rather than to intermittent strain. The

best known of these neuroses are writer's cramp, telegrapher's cramp, and miner's nystagmus. These cramps, or palsies, are the result of a weakening or breaking down in a central controlling mechanism of the brain, resulting in spasm and incoordination of the muscles. Miner's nystagmus, by far the most prevalent of these neuroses, is typically characterized by a definite sign — oscillation of the eyeballs.

**421. Boiler-maker's deafness.** This is popularly said to be due to a bursting or a weakening of the eardrum. There is no doubt that the effect of the loud noise is not so much to impair the sound-conducting part as to destroy the sensitive nerve endings which constitute the sound-receiving apparatus of the ear. A long-continued exposure to noise causes the delicate nerve structures of the internal ear to lose their power of conveying impressions to the brain. Prevention lies in plugging the ear canals with cotton.

**422. Glassworker's cataract.** In the making of glass bottles the finisher is exposed to the undiminished glare of the furnace or the tank of melting glass at a temperature of about 1500° F. The cataract formation is due to the heat rays and not to the light rays. Preventive measures lie in the use of glasses, which keep off 90 per cent of heat radiation and are opaque to the invisible ultra-violet rays. A recently invented machine which eliminates much of the manual labor now necessary for glass blowing is counted on to eliminate glassworker's cataract in the future.

**423. Anthrax.** Anthrax is primarily a disease of animals, but may be transferred to human beings. It is caused by the anthrax bacillus. Human beings may contract the disease by contact with a living animal suffering from it or with any of the parts of the carcass at the time of death, or subsequently in the processes of manufacture. Those who handle wool, hides, or hair sometimes get anthrax. The spores of anthrax are more resistant than the bacilli: they may remain alive

for years. Dust which contains these spores may come in contact with scratches and cuts invisible to the eye or they may be inhaled into the lungs.

Anthrax begins as an irritating sore on the skin. It is followed by a blistering and swelling which spreads rapidly. The condition is often fatal.

There are two ways of preventing anthrax: first, prevent animals from having the disease; secondly, disinfect suspected material such as wool or hides. Anthrax should be regarded as a serious disease. The injection of anti-anthrax serum in large doses gives the only hope.

**424. Industrial eczema.** This common malady is caused by irritation of the skin. Frequent continual soaking of the hands in water or in alkaline solution is sufficient to set up the condition, as in washerwoman's eczema. Industrial eczema is caused by irritants, caustic agents, dyes, and all substances which remove the natural grease from the skin, and by processes which mechanically injure the continuity of the skin (for instance, by scratching it). The condition is frequent among workers in tanning industries, furriers, and chemists.

**425. Dusty trades.** Dust is the greatest enemy of the worker. Its inhalation is the cause of much ill health. The principal trades and occupations in which excessive amounts of dust are found are all forms of grinding and many trades of polishing and cleaning. Also dust is found in the textile industries, in the lead, copper, and iron trades, in pottery works and masonry, and in the handling of leather, skins, feathers, wool, cotton, wood, paper, and tobacco. The kinds of dust vary greatly in their hygienic significance. The dust particles most important as mechanical irritants are the hard, irregular particles with sharp edges from iron, steel, and other metals and from stone, especially quartz and granite. The principal poisoning dusts are the dusts of lead, mercury, arsenic, phosphorus, and zinc. Persons exposed to excessive

amounts of dust for long periods of time suffer from a condition referred to earlier as silicosis. After a while the dust remains in the lungs without any apparent reaction on the part of the tissues, but sooner or later a fibrosis of the affected part of the lung takes place. This fibrosis takes the place of the normal lung tissue, and sooner or later, if the exposure is continued and the fibrosis extends, pulmonary tuberculosis usually follows. This happens when the irritating dust particles cause a low-grade inflammatory process upon which is implanted a tuberculous infection.

FIG. 156. The eye shield over the grinding wheel of this machine protects the eyes of the workman

Courtesy of the General Electric Co.

Exhaust ventilation, the use of special caps or hoods over the material used, and the use of respirators offer protection against dust.

**426. Effects of heat.** Stokers, bakers, firemen, and workers in foundries and steel mills are exposed to high degrees of heat. Respiratory diseases appear to be frequent in persons working under such a condition. Cataracts and other disorders of the eye are very frequent among persons exposed to intense heat.

**427. Preventive measures in occupational diseases.** To improve hygienic conditions under which people work and to prevent the diseases of occupation, several things are necessary: first, to educate the worker and familiarize him with

inherent dangers of his particular occupation and with the ordinary preventive measures. He should be taught the early signs by which a disease or diseases common in his field of occupation can be recognized. Secondly, there should be frequent periodic examinations of the worker to detect the early evidences of diseases and for the purpose of educating him in methods of prevention. Thirdly, dust should be prevented as far as possible through the use of a good system of ventilation to carry away the dust and fumes and to admit as much fresh air as can be had. There should be an even temperature in the workroom, without excessive humidity or dryness. Protective devices should not be limited to machinery, but should be worn by the workman himself. He should make use of overalls, cap, gloves, eyeglasses, respirator, and ear plugs if necessary.

Workers should keep themselves in excellent physical condition, and particular attention should be paid to the hygiene of the mouth. There should be a change of clothing before leaving the workshop. Provisions should be made for adequate washrooms and for bathing facilities. Toilet rooms, rest rooms, lunch rooms, and places for recreation should be provided. In large factories an industrial physician, whose full time is devoted to the health and care of the employees, should be engaged by the employer.

There should be a prescribed and limited number of working hours, with plenty of time and opportunity for the proper kind of recreation. Work and rest must be judiciously alternated; efficiency ceases when fatigue begins.

There should be laws to regulate working conditions to the end that the health of the workers shall be protected.

**428. Workmen's compensation laws.** The responsibility of employers is recognized in the workmen's compensation laws now in force in forty-two states and under the Federal government. These laws provide in general that a certain percentage of an employee's wages shall be paid to him during

his incapacity following injury and (in some states) during illness due to occupation. They also provide that such medical and hospital care as shall be needed to relieve and cure shall be furnished by the employer.

### *For Informal Discussion in Class and at Home*

1. What are you planning to do after you graduate? What do you know about the advantages or disadvantages, from the standpoint of health conservation, of the profession or business you intend to follow?

2. Do you know any physically handicapped student in your school — one who has defective vision or hearing, or who has a heart defect, or who is crippled? What advice as to vocational training should he receive?

3. Discuss the general factors one should consider in choosing a life work in a large city; in a small community, away from home.

4. Name, in the order of their relative importance to health, at least six different professions, businesses, and trades. Give reasons why you made your selections in the order named.

5. From the standpoint of an engineer or architect, what provisions to safeguard the worker's health should you emphasize in a factory building? in a high school? in an office building?

6. What provisions has your state made to safeguard the employment of women and children? What are employment certificates? What credentials must one possess to obtain them?

7. What is your father's occupation? Ask him to explain the occupational hazards of his vocation. What preventive measures does he employ to escape the occupational diseases?

8. Has your state a workmen's compensation commission? What are its functions? What benefits do workmen derive from the workmen's compensation law?

9. Visit a large industrial plant in your city. Make a list of the safety appliances you saw. What additional safety regulations should you recommend?

# CHAPTER XXIX

## PERIODIC HEALTH EXAMINATIONS

**429. An interesting story.** During the World War, so the story runs, an Australian private convicted of a crime for which the punishment was death was brought before the court-martial to hear sentence passed. The presiding officer, a colonel known for his clemency, informed him that in recognition of his excellent military record he was to be permitted to say how he should die.

"I will give you twenty-four hours to make up your mind," the colonel told him.

The next day the private was again brought before the court.

"Have you decided how you wish to die?" he was asked.

"Yes," replied the Australian; "of old age."

Whether or not he got his wish is not recorded, but the story illustrates the natural desire of each of us to live as long as possible. Fortunately science has made it possible for more people to live long and die naturally of old age than ever before. The one thing that is necessary is to carry out the teachings of science. Often we are too lazy to do this. We are inclined to think, especially if we have been in good health, that the illnesses and misfortunes of other people will escape us. All health experts are agreed that the first step on the road to health and happiness is to have a thorough physical examination periodically.

**430. How long will you live?** If one man out of a group of five adds ten years to his life, it can be stated statistically that on an average each of the five has added two years to his life. But this does not offer any great degree of comfort

to the other four; the fact that they are part of the average will not give them an extra lease of life.

Eighteen years have been added to the life span of the average person in the United States since 1855. At that time the average length of life was forty years; in 1921 it was fifty-eight, and is still increasing. Government figures and insurance companies' statistics all tell the same cheerful story. Certain groups of persons are in better health and they are living, on an average, longer than the general public. Vaccination, protective inoculation, pure water, better milk, and better sanitation have all helped to lengthen the average life span; but the story of longer life does not stop with these improvements in hygienic living. The people of this country are just beginning to understand the value of health protection and the necessity of health-building.

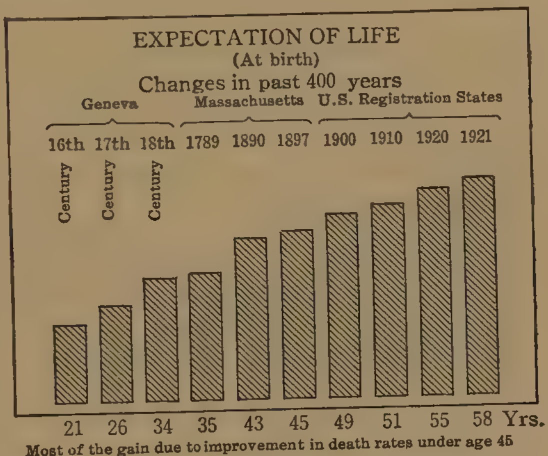


FIG. 157. The triumph of hygiene and modern medicine is indicated in this graph showing that the length of life is increasing

How will this affect you? How many of these eighteen extra years of life will you claim for yourself? Watching other men and women live longer will not help you: only by swinging into step with the present-day methods of life extension can you hope to live longer in good health. Within a comparatively few years the intelligent part of the public has learned that people are dying too soon, and that men and women are struggling along half sick, half well, because they do not know what is wrong with them.

**431. Health clients.** In answer to the question, How is your health? it is not uncommon to hear people say, "I am afraid to visit my doctor for fear of what he will tell me." We should have no such fears, for the sooner we pay that delayed visit to the doctor's office, the sooner will our minds be eased and our physical defects corrected or cured. It is far better to be a health client than a patient. The former comes for hygienic advice as to exercise, diet, and the care of the body, including dental care, rest, and play; the latter usually comes for medical or surgical treatment.

The practice of medicine in the past has been centered mainly on caring for the sick. At present it is centered about the investigation into the causation of disease and methods of prevention. As a result of such research certain specific illnesses can now be prevented. As typical examples one can mention smallpox, rickets, diphtheria, typhoid fever, measles, scarlet fever, malaria, scurvy, and simple goiter. We know also what modes of living are likely to keep us in such condition as to be least ready to contract disease.

**432. Be a health chauffeur.** The comparison of the human machine to an automobile is a time-honored illustration of the importance of periods of inspection and overhauling. The American Medical Association has pointed out that this illustration has not been pressed to the point where all of us recognize that to get the best service out of the human machine it must not only be in the best mechanical condition possible but must also have a *driver* to operate it intelligently. Too much time may have been spent in the past in repairing and overhauling defective motors. The habit of undergoing health examinations will present opportunities to physicians to make health chauffeurs of us.

**433. Public procrastination.** In the business world the discovery of a new force or a new method is almost immediately utilized. The radio became a commercial proposition almost

overnight, and the newest and best outfit sometimes becomes obsolete by tomorrow, but in public-health work a new development is taken up gradually and becomes general only after years of effort. For example, toxin-antitoxin for the prevention of diphtheria has been available for physicians without cost for the last nine years, but is not in general use yet.

In his opening address as chairman of the recent tuberculosis and health conference in New York City, Dr. William H. Welch made a plea for the wider application of the great public-health discoveries of the last few decades. Commenting on the use of these discoveries, Dr. Welch said:

> When a Koch discovers the tubercle bacillus, a Banting discovers insulin for the relief of diabetes, a von Behring brings forth antitoxin for the cure of diphtheria, or a Park demonstrates the value of toxin-antitoxin for the prevention of diphtheria, the world draws a long breath as if saying to itself, "Now we are rid of that terror which has haunted the human race for centuries." It then straight-way forgets and goes on its way comfortably assuming that of course the great discovery or invention is being carried into effect.
>
> The actual facts are quite different. A few people, those of unusual initiative, or ample means, or who happen to be under the care of exceptionally alert physicians, or within the jurisdiction of exceptionally competent health officers, receive the benefits of the new discoveries, but the great mass of the human race goes on as before, and the death rate from these diseases is reduced slowly and over long periods of time.

**434. Bank your health and be prosperous.** In a recent public address before a nonmedical group Charles E. Hughes, former Secretary of State, asked his audience, "What is most worth while?" and answered:

> Health is, for one thing. I do not mean simply the abounding vigor of youth, with abundance of fresh air and exercise and with its reserves which seem to mock the warnings of elders. I mean,

rather, the sustained and protected strength which is based on the conservation of physical resources and gives promise of a long life well lived.

In our onward journey the ranks are rapidly thinned by the passing out of those who had their brief day and were soon done. When their notes matured they were unable to meet them. Nothing is sadder than these physical bankruptcies, which deprive men and women of opportunities when with the capital of experience well invested they should have the most ample returns.

**435. Examinations pave the road to health.** Seventy-five per cent of all diseases are due to bacterial infections. Many of these disorders, caused by such infections, begin early in life, continue on insidiously, the individual being unaware of the presence of any abnormality until it has developed into a serious ailment.

Most people do not consult a physician until they have tried many home remedies without relief.

Incipient heart and kidney trouble and the early stages of hardening of the arteries may begin and progress without any warning or annoyance to the individual. The seat of infection in such disorders is usually found in diseased tonsils, abscessed roots of teeth, and infected sinuses. Bacteria from these foci find their way into the blood stream and eventually affect the joints, heart, blood vessels, gall bladder, and kidneys. As a result of such infections people sometimes develop arthritis, rheumatism, heart trouble, hardening of the arteries, gall-bladder inflammation or stones, kidney trouble, or ulcers of the stomach and intestines.

**436. Longevity.** The early elimination of any and all sources of infection is absolutely necessary in order to diminish such disorders. The prompt correction and care of any abnormality, irrespective of its cause, is essential to happiness, to freedom from disease, and to longevity. Strictly, the term "longevity" means long life; but progressive physicians of the

new school of preventive medicine are employing the term to mean the prolongation of life in the state of ideal health.

A complete physical examination, even of the apparently healthy individual, is a health measure that should be practiced at least once a year, in order that minor ailments and the beginning of such diseases as tuberculosis, diabetes, and the anæmias can be detected in their beginnings and checked or cured. Arrest the symptom that "doesn't amount to anything" and you will prevent the development of more serious conditions.

The importance and economic value of periodic health examinations—that is, visiting your medical adviser when you are well, at least once every year—is being recognized all over the country. Physicians should be engaged to keep people out of hospitals.

FIG. 158. A sensible man

Although apparently in good health he makes an appointment with his physician for a health examination

The annual health week observed in the public schools throughout the country is an indication that our public authorities have learned that it pays to detect and correct physical and mental abnormalities as early in the child's life as is possible. Parents are assisting teachers in their efforts to make children happier, healthier, and mentally more alert through the prevention of disease and the removal of physical defects. Instead of waiting for disease to develop, emphasis and reliance are being placed on those measures that will make us

immune to disease. What is being done for the younger generation is now recognized as good practice for their elders.

**437. Consult your health adviser.** It has been suggested that one's birthday be used as an occasion for that annual overhauling and for a heart-to-heart talk with a physician who isn't too busy to talk health, not disease. Look upon him as a medical adviser and not as a medicine man. Obtain from him an estimate of your state of health; seek guidance in the means of maintaining or improving it, or ask for specific advice on how to avoid the disabilities of advancing years.

**438. Healthful or healthless.** The personal-history form for periodic health examinations, on page 469, has been prepared by the American Medical Association for the use of physicians as a guide to estimate the individual health and hygienic habits of health clients. It compares with the forms prepared by psychologists to estimate individual intelligence. Read the form carefully, study it, and benefit by its suggestive answers.

After the health client has answered the questions in the personal-history form, he is ready for a physical examination.

**439. After the examination, what?** The purpose of a health examination is merely to reveal undiscovered hygienic problems and to suggest appropriate remedies. Unless the physician's recommendations are carried out immediately after physical defects or hygienic irregularities are discovered, the benefit of such an examination is apt to be lost. Intelligent people will readily understand the importance of preventive or curative measures, and the results will show in improved work, more pleasing disposition and personality, improved economic status, better home environment, and a more healthful outlook on life. There is still much to be done to overcome prejudice and old-fashioned ideas regarding corrective measures such as operations and the use of hospitals. Such opposition should be efficiently and tactfully removed in order to gain for his own good the patient's confidence and coöperation.

There should be no hesitancy on the part of health clients or patients to consult their medical advisers whenever advice is needed. Neighbors are consulted far too frequently on matters of hygienic, medical, or surgical nature, when authoritative information can be obtained from more reliable sources.

**440. Keep health essentials in mind.** We have now come to the end of this book. If you have mastered its lessons and practiced what you have learned, your study should bring rich returns in health and happiness. Unless misfortunes beyond your control come to you, you should keep your health and even improve it.

It pays to take care of the body. When you are ill get the best medical advice. Get the best medical advice to help you to prevent disease and acquire good health. You use your intelligence in school and in a business way; it is plain common sense and good business to strive to be healthy. Will you do it? The answer depends upon you.

Remember that good health habits pay. The *Telephone Review*, with a keen vision of good business, presents some of the essentials of healthful living in the following:

WHAT PRICE HEALTH?

"What would you bid if health was placed on the auction block and sold to the highest bidders?"

"Well, for our part, we would mortgage the old homestead, sell the car, throw in our job, draw on our balance in the bank, do everything to keep our good health."

There isn't much in life that's worth while if you haven't health to enjoy it.

Why not make health a habit? It is easy to do: get enough exercise in the open air, eat good plain food, sleep in well-ventilated rooms, do everything in a normal way, and you're pretty sure to be healthy.

*For Informal Discussion in Class and at Home*

1. Why is prevention better than cure? Is there an example of this in your own family? Report on "Do physical examinations pay?" Ask life-insurance companies how the periodic examination of policyholders has saved them money. Find out about loss of time from business; from premature old age.

2. Report an interview with your private physician (or school physician) on dangers of underweight in children; on dangers from neglected teeth, bad tonsils, nasal obstruction, sinus disease.

3. After members of your class have had a thorough physical examination, make a summary of their defects. Do the same thing a month later; after six months. Make a graph to show progress.

4. State your reasons for agreeing or disagreeing with the following statement made by a mother of a child: "My idea is that the school is for educational purposes, and the health of my child I shall attend to when occasion arises."

5. Tell which is of more value to you: your watch, your father's car, or your body. Are there "spare parts" for your body?

6. What is your physician's name? Are you in the habit of consulting him when you are sick, or do you have him "look you over" periodically? Which practice costs less? brings greater returns?

7. Assuming that you have had the good fortune of having a health examination, what are some of the questions the doctor asked you? What are some of the things he did? What are some of the things he told you?

8. In terms of sanitation and hygiene, what advantages has the present generation over those who lived a century ago? What evidences are there to substantiate your statements?

9. When you say to a friend "How are you?" what do you really mean to inquire into? If the same question were put to you, how should you answer? How do you know?

10. Why do you suppose the board of education urges parents of children just starting in high school to have a health conference with the family physician?

# APPENDIX

## PERIODIC HEALTH EXAMINATION[1]

### Personal-History Form

Use check mark (√) in making affirmative answer to questions wherever possible.

**1. Name** — **Country of birth**
**2. Address** — **White** — **Colored**
**3. Age** — **Religion** — **Single** — **Married** — **Widowed** — **Divorced**
**4. What is your present occupation**
5. Have you changed your work frequently — Why
**6. What are the conditions of your work**

| | | | | | |
|---|---|---|---|---|---|
| Regular | Dangerous | Dark | Smelly | Seated | Hours per day |
| Satisfactory | Fatiguing | Light | Noisy | Standing | Days per week |
| Monotonous | Indoors Out | Dusty | Crowded | Walking | |

7. Are your earnings sufficient to support yourself and dependents comfortably
**8. What are your home conditions**

| | | | |
|---|---|---|---|
| In a family | Congenial | Quiet | Room and bed to yourself |
| Alone | Depressing | Irritating | Time to yourself |

**9. What are your sleeping conditions**

| | | | |
|---|---|---|---|
| Hours in bed | Windows open | Restful | Disturbed |

**10. How often do you eat**

| | | | |
|---|---|---|---|
| Regularly | Where | Between meals | Time of meals |

**11. Are you a moderate or hearty eater,** taking one or more helpings at a meal of

| | | |
|---|---|---|
| Meat (including fish and eggs) | Pie, cake, or pastry | Salads |
| Baked beans | Sweets or sugar | Bread |
| Green vegetables (spinach, cabbage, etc.) | Fruits | Butter |
| Potatoes (rice, macaroni, or cereal) | | |

**12. How much do you drink daily of**

| | | |
|---|---|---|
| Milk | Tea | Soft drinks |
| Water | Coffee | Alcoholic drinks |

13. How frequently do you use candy — How much tobacco
**14. Do you have a movement of the bowels daily** — With use of drugs
15. What exercise do you take in addition to your work
16. What are your social, religious, political, club, or trade associations
17. What are your pleasures — recreations — hobbies

[1] Prepared and published by the American Medical Association, 535 North Dearborn Street, Chicago, Illinois.

**18. Are you subject to worries  Moods  Periods of alternating gloom and cheerfulness**

**19. Have you ever been ill with any of the following, or any other severe illness and at what ages**

| | | |
|---|---|---|
| Tuberculosis | Diphtheria | Convulsive seizures |
| Malaria | Typhoid fever | Nervous breakdown |
| Rheumatism | Tonsillitis (sore throat) | Migraine or neuralgia |
| Scarlet fever | Frequent colds | |

**19A. Do you ever have**

| | | |
|---|---|---|
| Headaches | Colds | Nausea or vomiting |
| Loss of appetite | Cramps | Palpitation |
| Shortness of breath | Swellings | Boils |

**20. Have you been protected against** Smallpox Typhoid Diphtheria **or other diseases by vaccination and when**

21. Have you had any accidents, broken bones, or surgical operations

22. How often do you consult your dentist  When last

**23. Are your parents, brothers, and sisters living**
If not, what were the causes of death and at what ages

24. Have either of your parents or any brother or sister had

| | | |
|---|---|---|
| Tuberculosis | Cancer | Insanity |
| Epilepsy | Gout | Diabetes |

**25. Do you consider yourself in good health**  If not, what is your complaint

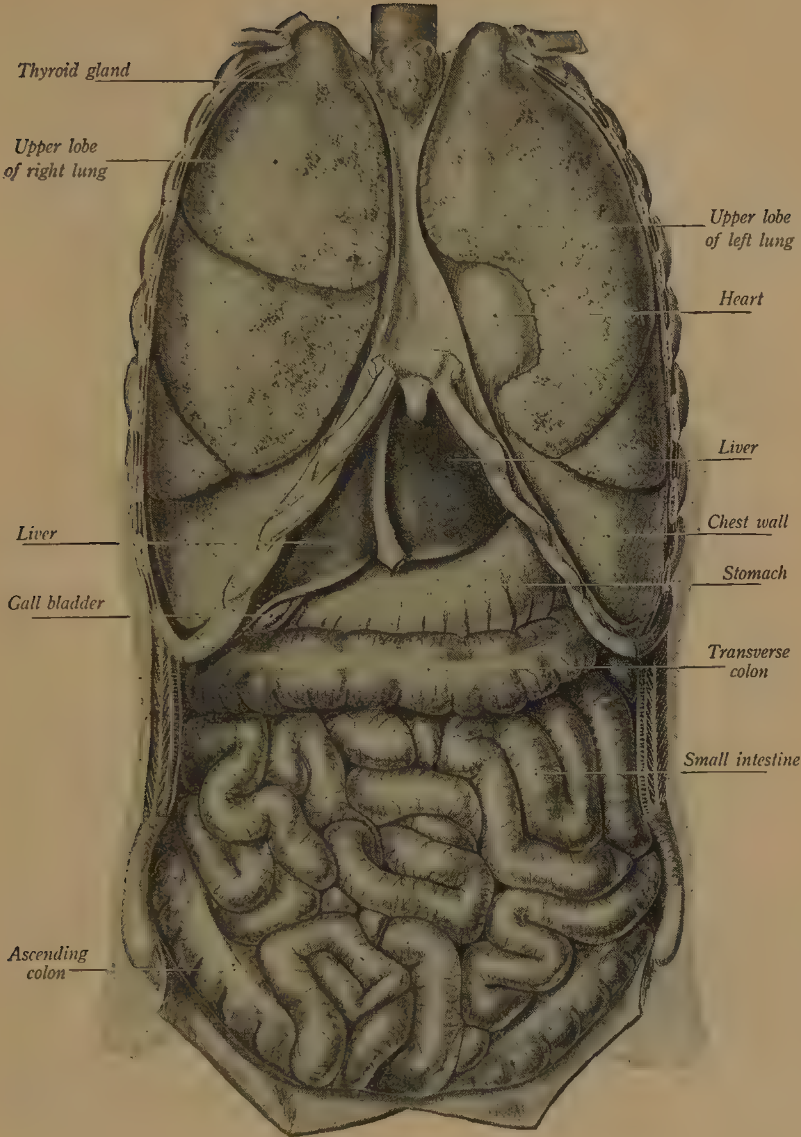


PLATE A

A comparative anatomical view (front) of the organs contained in the thoracic cavity and in the abdominal cavity. The bony framework of the chest has been partly removed to display the lungs. The abdomen has been laid bare to expose the organs of digestion

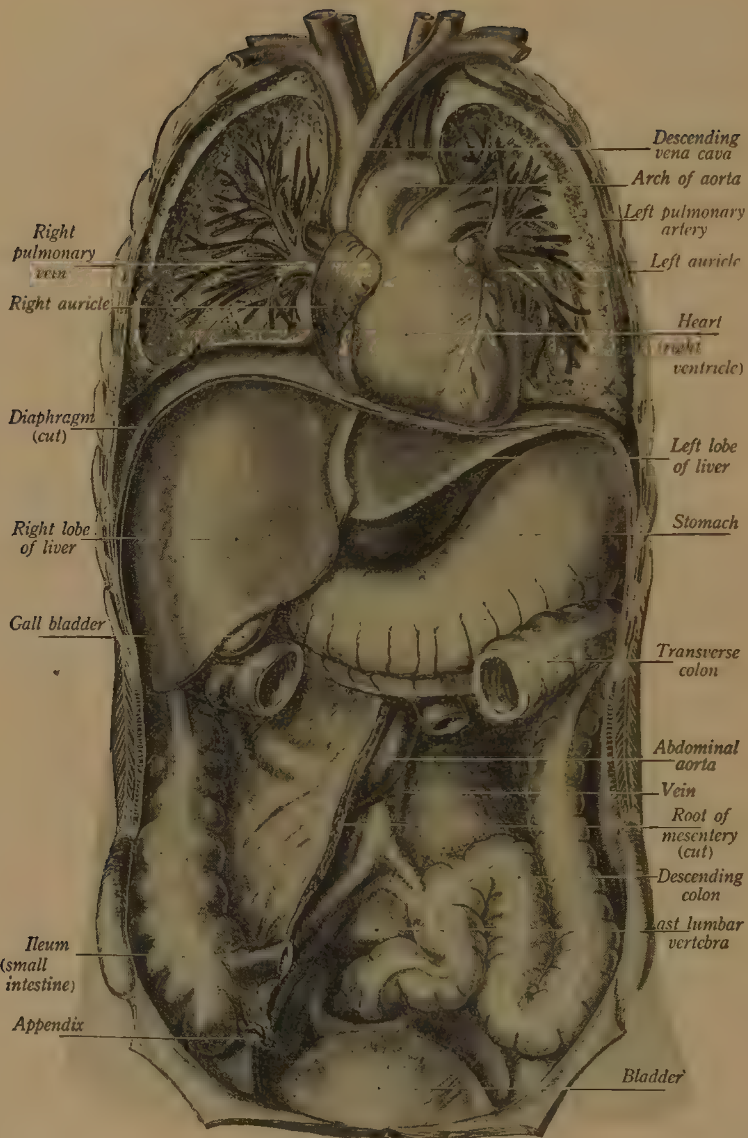


PLATE B

A view of the body cavities at a deeper level. The diaphragm muscle separates the two cavities. The interior of the lungs is exposed. The heart with its main blood vessels occupies the left side of the thoracic, or chest, cavity. The small intestine has been removed to illustrate the position and course of the large intestine

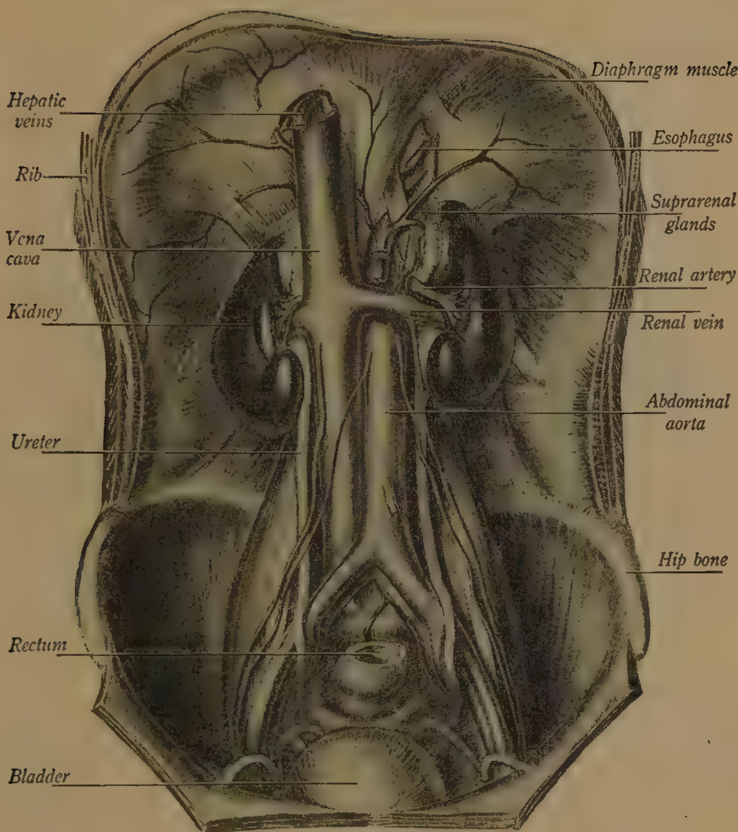


PLATE C

Upon removing all the organs of digestion we come to a still deeper level of the abdominal cavity, where we see large blood vessels, the kidneys, the suprarenal glands, and the ureters that lead from the kidneys to the bladder

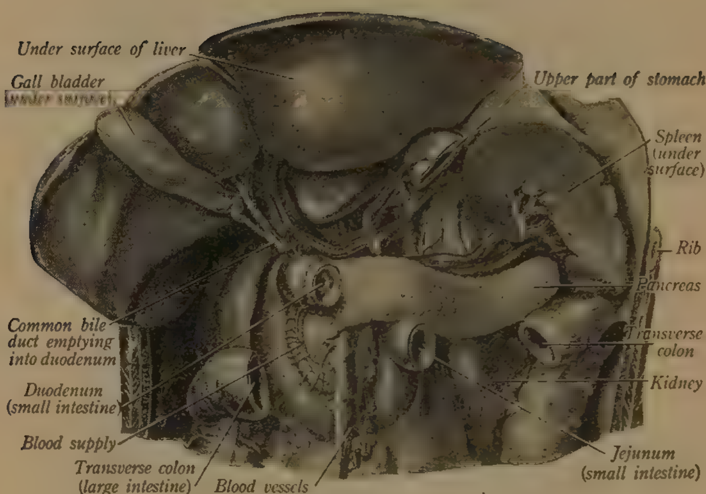


PLATE D

An anatomical study of how the digestive juices of the liver and pancreas reach the duodenum of the small intestine. The liver has been raised to exhibit the gall bladder with its bile duct, and the pancreas with its pancreatic duct running lengthwise through the pancreas. These two ducts carry the digestive juices, bile and pancreatic juice respectively, into the duodenum, meeting at a point just outside the duodenum called the ampulla of Vater (see Fig. 43). The tail, or tip, of the pancreas contains the islands of Langerhans, where insulin is secreted

# INDEX

KEY. āle, senāte, ăt, câre, ȧsk, ärm, finạl, ạll; ēve, ėvent, ĕnd, hẽr, recẹnt; īce, ĭll, admịral; ōld, ōbey, ŏn, fôr, anchọr; ūse, ūnite, ŭp, fûr, circụs, menü; fōōd, fŏŏt; ch *as in* chop; g *as in* go; ng *as in* sing; n̲ *as in* ink; th *as in* thin; th *as in* the; oi *as in* oil; ou *as in* noun; N (*the French nasalizing* n), *nearly like* ng *in* sing; K *as in German* ich, ach.


Absorption in small intestine, 111 f.
Accidents, defective vision as cause of, 219; prevention of, on public highways, 334 ff.; in schools and workshops, 337; at home, 337 ff.; on vacations, 340; in industry, 448
Accommodation, 209
Acids (ăs′ĭdz), balance between alkali and, in body, 34
Acne (ăk′nė), 241 ff.
Adenoids (ăd′ė noidz), 40
Adrenal (ăd rē′nạl) glands, 158
Agriculture, health work of the Department of, 401
Air, 50 ff.; pressure of, 45
Alcohol (ăl′kō hŏl), as a drug, 143, 265 f., 276 f.; in liquors, 264 f.; as a narcotic, 266; and self-control, 267; and muscular work, 267 f.; and mental efficiency, 268 ff.; and death rate, 270 ff.; and resistance to disease, 272; and safety, 272 ff.; and athletics, 275; and success, 275 f.
Alkalis (ăl′kạ līz), balance between acids and, in body, 34
Amœba (ạ mē′bạ), 15 f.; division of, 16
Anabolism (ăn ăb′ō lĭz′m), 114
Anæmia (ạ nē′mĭ ạ), 25, 312
Anæsthetics (ăn ĕs thĕt′ĭks), 308 ff.
Anaphylaxis (ăn′ạ fĭ lăk′sĭs), 146
Anthrax (ăn′thrăks), 455 f.
Antitoxin (ăn tĭ tŏk′sĭn), diphtheria, 288
Aorta (ā ôr′tạ), 28
Arches, fallen, 195
Arteries (är′tẽr ĭz), elasticity of, 28; nervous control of, 31
Artificial respiration, 346 ff.
Ashes, disposal of, 385
Asphyxiation (ăs fĭk sĭ ā′shụn), 339
Association, regions of, in brain, 70
Associative neurones (nū′rōnz), 64 f.
Asthma (ăz′mạ), 312
Astigmatism (ạ stĭg′mạ tĭz′m), 211 f.
Athletics, alcohol as enemy of, 275; tobacco and, 279
Audiometer (ô dĭ ŏm′ė tẽr), 229
Auditory canal, 222
Auricles (ô′rĭ k′lz), 27 ff.
Autonomic (ô tō nŏm′ĭk) system, 67, 71 f.

Bacteria (băk tē′rĭ ạ), in air, 52; discovery of, 287; appearance of, 289 f.; destruction of, 297
Banting, F. G., 158 f., 288
Bathing, 250 f.; of patient, 325; of baby, 365
Bathroom, 390
Behring, (bā′rĭng) Emil von, 288
Beriberi (bĕr′ĭ bĕr′ĭ), 133 f., 312
Bile, 110 f.
Birth registration, 357
Bites, 345 f.
Blackheads, 242
Bladder, 35
Blood, work of, 21 f.; distribution of, 22; plasma of, 22, 24; coagulation of, 26 f.; circulation of, 23, 27 ff.; discovery of circulation of, 287
Blood pressure, 31 ff.; testing of, 32
Botulism (bŏt′ū lĭz′m), 139 f.
Brain, 68 ff.; regions of, 70
Breakfast, 135
Breathing, 37 ff.; exercises for, 47 ff.
Bronchial (brŏn′kĭ ạl) tubes, 38, 44

Bruises, 343
Building regulations, 380 ff.
Burns, 344

Calcium (kăl′sĭ ŭm) in foods, 130, 132
Calories (kăl′ō rĭz), as measure of nutritional value, 116; in foods, 121 ff.
Candy, avoidance of large amounts of, 94
Capillaries (kăp′ĭ lâ rĭz), 20, 28, 111
Carbohydrates (kär bō hī′drātz) in food, 115 f., 120
Carbon dioxide (kär′bon dī ŏk′sīd), in blood plasma, 24; elimination of, 34
Carbon monoxide (mŏn ŏk′sīd), danger from, 54
Cardiac (kär′dĭ ăk) cycle, 29
Cardio-accelerators (kär′dĭ ō ăk sĕl′ĕr-ā′tērz), 31
Cardio-inhibitors (ĭn hĭb′ĭt ērz), 31
Cataract, glassworker's, 455
Catarrh (ka tär′), nasal, 38
Cellars, sanitary, 382
Cells, nature of, 16; growth of, 17; kinds of, 17 ff.
Cerebellum (sĕr ê bĕl′ŭm), 70
Cerebrospinal (sĕr′ê brō spī′nal) system, 67
Cerebrum (sĕr′ê brŭm), 70
Cervical (sûr′vĭ kal) curve, 181
Child Hygiene (hī′jĭ ēn), Bureau of, 404
Children, physical development of, 358 f.; mental development of, 361 f.; keeping the, well, 374 ff.; employment of, 450
Choroid (kō′roid), 207
Chyme (kīm), 108
Cilia (sĭl′ĭ ą), 17; of trachea, 44
Circulation, lymphatic, 21; blood, 21
Cleaning, vacuum, 390
Clothing, protective use of, 252 f.; and warmth, 255 ff.; comfortable, 257; different substances for, 258 ff.; for infant, 364
"Clotting time," 26
Coagulation (kō ăg′û lā′shun), 26 f.
Cocaine (kō′ka ĭn), 281
Cochlea (kŏk′lê ą), 225
Cocoa, nutritive value of, 144
Coffee, use of, 143 f.
Colds, 306
Commerce, health work of the Department of, 402
Complexion, healthy, 238 f.
Concentration and the healthy mind, 78
Connective tissue, 18
Convalescence (kŏn va lĕs′ens), 326 f.
Convolutions (kŏn vô lū′shŭnz), 70
Convulsions, 347
Cornea (kôr′nê ą), 207
Corpuscles (kôr′pŭs′lz), red, 22, 24 f.; white, 25
Cortex (kôr′tĕks), 70
Cosmetics (kŏz mĕt′ĭks), 238 f.
Cotton, for clothing, 259
Cows, healthy, 431 ff.; careful milking of, 434 f.; buildings and equipment for, 435 f.
Cranial (krā′nĭ al) nerves, 71
Cranium (krā′nĭ ŭm), 70
Cretinism (krē′tĭn ĭz′m), 157
Croup (krōōp), 348
Cuticle (kū′tĭ k′l), 239
Cuts, 342

Dairy employees, health certificates for, 433 f.
Dairy products in diet, 138
Deafness, prevention of, 227; boilermaker's, 455
Death rate, drink and, 270 ff.
Defects, removal of physical, 6 f.
Deficiency diseases, 312
Dentifrices (dĕn′tĭ frĭs ez), 97, 284
Dentist, consultation with, 100, 102 f.
Dermis (dûr′mĭs), 239
Diaphragm (dī′a frăm), 46
Diastole (dī ăs′tô lē), 29
Diet, choosing, 127 f.; balanced, 134 f.; satisfactory, 138 f.
Digestion (dĭ jĕs′chŭn), in mouth, 88; meaning of, 105 f.; in stomach, 106 ff.; in small intestine, 108 ff.
Digestive system, 106 ff.
Dinner, 135
Diphtheria (dĭf thē′rĭ ą), 303 ff.; use of antitoxin, 288; Schick test for susceptibility to, 288
Diseases, alcohol and resistance to, 272; conquest of, 286 ff.; degenerative, 289; contagious, 289, 318; transmission of, 290 ff.; of infants

and young children, 373 ff.; water-borne, 413 f.; occupational, 450 ff., 457 f.
Dishes, washing of, 392
Drowning, 348 ff.
Drug, alcohol as a, 143, 265 f.; alcohol as a habit-forming, 276 f.; tobacco as a habit-forming, 278 f.; narcotic as habit-forming, 281 f.
Drug habit, 281 f.
Dust, in air, 52; in trades, 456 f.
Dwelling, site of, 380

Ear, structure of, 222 f.
Earache, 227
Eardrum, 223 f.
Eczema (ĕk′zē mạ), industrial, 456
Effectors (ĕ fĕk′tẽrz), 63 f.
Electric shock, 342
Elimination (ē lĭm ĭ nā′shụn), 146 f.
Emmetropia (ĕm ē trō′pĭ ạ), 209
Endocrines (ĕn′dō krĭnz), 154 ff.
Energy requirements, of different ages, 116; of average adult, 120 f.
Energy values of food constituents, 116
Enzymes (ĕn′zīmz), 90, 107 f., 110
Epidermis (ĕp ĭ dûr′mĭs), 239
Epithelial (ĕp ĭ thē′lĭ ạl) tissue, 18
Esophagus (ē sŏf′ạ gụs), 106
Ether (ē′thẽr), surgical operation with, 287
Eustachian (ū stā′kĭ ạn) tube, 39, 225
Examinations, health, 464 ff.; 469 f.
Exercise, physiological effects of, 171 f.; rhythmic, 172; vigorous physical, 173; fatigue and, 173 f.; to promote good posture, 189 ff.; for flatfoot, 199 f.
Exophthalmic (ĕk sŏf thăl′mĭk) goiter, 157
Eye, anatomy of, 205 ff.; testing the, 214 f.; disorders of, 215 f.; hygiene of, 217 f.; foreign bodies in, 352
Eye strain, 210 f.
Eyeglasses, 216

Factory sanitation, 448
Fainting, 341
Farsightedness, 210
Fatigue, physiology of, 164; symptoms of, 165; avoidance of chronic, 165; and exercise, 173 f.; in industry, 448 f.
Fats, in blood plasma, 24; in food, 115 f., 120
Federal government, public-health work of, 396 ff.
Feeding, of the sick, 325; of infant, 370 ff.
Fever, 329 f.
Fibrin (fī′brĭn), 27
Filtration (fĭl trā′shụn) of water, 426 ff.
First-aid kit, 233
Flatfoot, 195, 199 f.
Flies, protection against, 388 f.
Focal (fō′kạl) infections, 92
Fontanels (fŏn tạ nĕlz′), 359
Food, uses of, 115; constituents of, 115 f.; caloric (kăl′ô rĭc) value of, 121 ff.; relative amounts of vitamins in, 136 f.; cooking of, 142; spoiled, 142 f.; canned and dried, 143; fads in, 144; milk as, 144 f., 430
Food poisoning, 139 f.
Foods and Drugs, Bureau of, 404 f.
Foot, mechanism of, 194; ailments of, 195 ff.; preventable troubles of, 201 f.
Fractures (frăk′tûrz), 351

Ganglia (găn′glĭ ạ), 71
Garbage, disposal of, 384 f.
Gastric (găs′trĭk) juice, 107
Glands, control of, by autonomic system, 67; salivary, 89 f.; of internal secretion, 114 f.; duct, 152 f.; ductless, 153 f.; tear, 206; sweat, 240; sebaceous, 240, 242
Goiter (goi′tẽr), 131
Gorgas (gôr′gạs), William C., 288

Habits, importance of health, 7 f. change of, 262
Hæmoglobin (hē mō glō′bĭn), 22, 25
Hair, 240; care of, 246 ff.
Hands, care of, 244, 246
Happiness, health as foundation of, 1 f.
Harvey, William, 287
Health, as foundation of happiness, 1 f.; meaning of, 5; possibility of good, 6; mental, 74 ff.; state de-

partments of, 402 f.; city departments of, 403 ff.
Health examinations, periodic, 465 f., 469 f.
Health habits, importance of, 7 f.; formation of, 8 ff.; score sheet as help in forming, 11 ff.
Hearing, 221 ff.; defective, 226 f.; testing, 228 ff.
Heart, structure and function of, 27 ff.; valves of, 29 f.; nervous control of, 30 f.
Heat, production and distribution of, 21, 254; bodily, 253; regulation of, 255; loss of, 255, 257 f.; effects of, 457
Heating, 52 ff.; of factories, 448
Height of child, 359
Height-weight-age tables, 117 ff.
Heredity (hē rĕd'ĭ tĭ), 376 ff.
Heroin (hē rō'ĭn), 281
Highways, accident prevention on, 334 ff.
Home, accident prevention at, 337 ff.; lighting in, 382 f.
Home medication, 327 ff.
Hormones (hôr'mōnz), 22, 154
Hospital, treatment at, 317
Humidity (hū mĭd'ĭ tĭ), optimum, 51
Humor, aqueous, 208; vitreous, 208
Hyperopia (hī pēr ō'pĭ ạ), 210

Idiosyncrasy (ĭd ĭ ō sĭn'krạ sĭ) to food substances, 146
Illness, home care in, 317
Immigrants, examination of, 398
Immunity, natural, 299; acquired, 299 f.; artificial, 300
Infant, development of, 358 ff.; care of, 362 ff.; feeding of, 370 ff.; diseases of, 373
Infant welfare, 356
Infection, routes of, 295 ff.
Inhibition (ĭn hĭ bĭsh'ụn), 69 f.
Initiative (ĭn ĭsh'ĭ ā tĭv) in formation of health habits, 8
Insects, 388 f.
Insulin (ĭn'sū lĭn), 158 f., 311; discovery of, 288
Interior, health work of the Department of, 402
Intestine (ĭn tĕs'tĭn), chemical changes in, 108, 110 f.; absorption in, 111 f.; large, 112
Iodine (ī'ō dĭn), in foods, 130 f.; in thyroxin, 156
Iris (ī'rĭs), 208
Iron in foods, 130, 131
Isolation (ī sō lā'shụn), 297, 321

Jenner (jĕn'ēr), Edward, 287, 301
Joints, 184, 186

Katabolism (kạ tăb'ō lĭz'm), 114
Kidneys, efficiency of, 24; function of, 34 f.
Kitchen, 391 f.
Koch (kōk), Robert, 288

Labor, health work of the Department of, 401
Larynx (lăr'ĭnks), 38
Leeuwenhoek (lā'vĕn hŏŏk), Anton van, 286
Lens, crystalline, 208
Leucocytes (lū'kō sīts), 25
Life, enjoyment of, 1; expectation of, 461
Lighting, of sick room, 322; in home, 382 f.
Lightning stroke, 342
Linen, 260
Lipase (lĭp'ās), gastric, 108
Liquors, alcoholic, 264 f.
Lister, Joseph, 288, 310
Long, Crawford W., 287, 308 f.
Longevity (lŏn jĕv'ĭ tĭ), 464
Lumbar (lŭm'bạr) curve, 181
Lunch, 135
Lungs, work of, 44 f.
Lymph (lĭmf), 20 f.
Lymphatics (lĭm făt'ĭks), 21

Mastication (măs tĭ kā'shụn), 89
Mastoiditis (măs toid ī'tĭs), 227
Medicine, beginnings of modern, 287 f.; preventive, 375 f.
Medulla oblongata (mē dŭl'ạ ŏb lŏn gā'ta), 71
Membrane (mĕm'brān), mucous, 38
Mental efficiency, alcohol and, 268 ff.
Metabolism (mē tăb'ō lĭz'm), 114
Milk, as food, 144 f., 430; contamination of, 430 f.; pasteurized, 436 ff.;

grades of, 438 f.; future supply of, 439 f.; supply of, for rural communities, 441
Morphine (môr′fĭn), 281
Mosquitoes, protection against, 388
Mother's helper, 363
Motor control of blood vessels, 31
Motor nerves, 71
Motor neurones (nū′rōnz), 64 f.
Motor regions in brain, 70
Mouth, and good health, 86 ff.; digestion in, 88; influence of, on general health, 90 ff.; washes for, 98
Mucous membrane (mū′kus mĕm′brān), 38
Muscles, control of, 67; involuntary, 71; alcohol and work of, 267 f.
Muscular tissue, 19
Myopia (mī ō′pĭ a), 209
Myxœdema (mĭk sē dē′ma), 157

Nails, 241
Narcotic (när kŏt′ĭk), 281 f.; alcohol as a, 266
Nasal (nā′zal) obstruction, causes of, 40; detection of, 41; results of, 41
Nearsightedness, 209 f.
Nervous system, mechanism of, 64 ff.; health of, 72 f.
Nervous tissue, 19
Neurones (nū′rōnz), 64 ff.
Neurosis (nû rō′sĭs), 454 f.
Nose, 38; hygiene of, 42, 44. *See also* Nasal obstruction
Nosebleed, 343
Nucleus (nū′klē us) of amœba, 16
Nurse, selection of, 320 f.
Nursery, 362 f.
Nursery maid, 363
Nutritional (nû trĭsh′un al) value, calories as measure of, 116; tables of, 121 ff.

Occupation, choice of, 442 ff.
Occupational hazards, 450 ff.; preventive measures for, 457 f.
Occupations, survey of, 445
Oculist (ŏk′û lĭst), consultation with, 216 f.
Olfactory (ŏl făk′tô rĭ) nerve, 71
Opium (ō′pĭ um), 281
Optic (ŏp′tĭk) nerve, 71
Optician (ŏp tĭsh′an), 216
Optometrist (ŏp tŏm′ê trĭst), 216
Organism (ôr′gan ĭz′m), single-celled, 15 f.
Organs, tissues in, 19
Oxidation (ŏk sĭ dā′shun) in tissues, 21
Oxygen (ŏk′sĭ jen), function of, 37

Palate (păl′ât), hard, 38; soft, 38
Pancreatic (păn krê ăt′ĭk) juice, 110
Pasteur (pås tûr′), Louis, 287
"Pasteurization" (pås tēr ĭ zā′shun), 287
Pasteurized (pås′tēr īzd) milk, 436 ff.
Patent medicines, avoidance of, 129, 159; misleading advertisements of, 283 f.
Patient, care of, 323 ff.
Pellagra (pĕ lăg′ra), 312
Pepsin (pĕp′sĭn), 107 f.
Pests, 388 f.
Phagocytosis (făg ô sī tō′sĭs), 25
Pharynx (făr′ĭnks), 38 f., 44
Phosphorus (fŏs′for us) in foods, 130
Physician, selection of, 318 ff.
Pituitary (pĭ tū′ĭ tâ rĭ) gland, 115, 157 f.
Plasma (plăz′ma), 22, 24
Plates, blood, 26
Plexus (plĕk′sus), 72
Plumbing, 389
Poison ivy, 313
Poisoning, lead, 452; mercury, 453; arsenic, 453; copper, 453 f.; benzene, 454
Poisons, 344 f.
Posture (pŏs′tûr), 177 ff.; essentials of good, 187 f.; promoted by healthful living, 188 f.; exercises to promote good, 189 ff.
Preventable Diseases, Bureau of, 405 f.
Preventive medicine, 375 f.; longevity as aim of, 465
Proteins (prō′tê ĭns), in blood plasma, 24; in food, 115 f., 120 f.
Protoplasm (prō′tô plăz′m), 16, 114
Ptyalin (tī′a lĭn), 90
Public health, 394 ff.
Pulmonary (pŭl′mô nâ rĭ) artery, 28
Pulmonary veins, 28
Pulse, 331
Pure-food laws, 141

Quarantine (kwŏr'ạn tēn), 297, 321

Rabies (rā'bĭ ēz), treatment for, 287, 311
Race, improvement of, 376 ff.
Race hygiene, 376
Receptors, 63 f.
Reed, Walter, 288
Refraction, 209
Refrigeration (rē frĭj ẽr ā'shụn), 389 f., 428 f.
Rennin, 107
Respiration (rĕs pĭ rā'shụn), organs of, 43; control of, 46; rate of, 331
Retina (rĕt'ĭ nạ), 207
Ribs, 183 f.
Rickets, 134, 312
Roentgen (rûnt'gẹn), William, 288
Roughage, 134
Rubbish, disposal of, 385
Rural communities, removal of wastes in, 386; disposal of sewage in, 387 f.; sewerage problems in, 419; milk supply for, 441

Sacral (sā'krạl) curve, 181
Safety, alcohol and, 272 ff.
Saliva (sạ lī'vạ), action of, 90
Salivary (săl'ĭ vâ rĭ) glands, 89 f.
Salts, in blood plasma, 24; as constituents of foods, 129 ff.
Sanitary Bureau, 405
Scalds, 344
Scarlet fever, 305; Dick test for, 288, 305
Schick (shĭk) test, 288, 303
Schools, accident prevention in, 337
Sclera (sklē'rạ), 207
Score sheet, as help in forming health habits, 11 ff.
Scurvy (skûr'vĭ), 134
Sedimentation (sĕd ĭ mĕn tā'shụn) treatment of sewage, 388
Self-control, power of, 62 ff.; and the healthy mind, 81 f.; alcohol and, 267
Sensation, conversion of, into action, 65; regions of, in brain, 70
Sense organs, dependence of knowledge on, 63
Sensory neurones (sĕn'sô rĭ nū'rōnz), 64 f.
Septic tank, 388
Serums (sē'rŭmz), 303
Sewage, disposal of, 386, 421 ff.; disposal of, in rural homes, 387 f.
Shoe, size and shape of, 197 f.
Sick room, records of, 318; selection of, 321; ventilation of, 322; lighting of, 322; cleaning of, 323
Silicosis (sĭl ĭ kō'sĭs), 454
Silk for clothing, 260
Sinuses (sī'nŭs ĕz), 38
Skeleton, 179 ff.
Skin, 239; general health and, 241; suggestions on care of, 243; loss of heat through, 257 f.; bruises of, 343
Skin test for hypersensitivity to foods, 146
Sleep, 166 ff.; of baby, 365 f.
Smallpox, 300 ff.
Spinal (spī'nạl) cord, 65, 66, 67 f.
Spine, curves of, 181
Sprains, 343
Steam heating, 56
Stethoscope (stĕth'ô skōp), invention of, 287
Stimulus (stĭm'ū lŭs), 65
Stomach, digestion in, 106 f.
Strabismus (strạ bĭz'mŭs), 212 f.
Suffocation, 346 f.
Sugar in blood plasma, 24
Sunlight and growth, 366 ff.
Sunstroke, 342
Surgery, foundation of modern, 288; romance of, 307 ff.
Swallowing, 106
Sweat glands, 240
Synapse (sĭn ăps'), 65, 66 f.
Systemic (sĭs tĕm'ĭk) veins, 27
Systole (sĭs'tô lē), 29

Tea, use of, 143 f.
Teeth, prevalence of poor, 87 f.; influence of, on general health, 90 ff.; cleaning of, 99 f.; of children, 359 ff.
Temperature, optimum, 51
Tendons, 186; of arch of foot, 195
Thoracic (thô răs'ĭk) curve, 181
Throat, 38 f.; hygiene of, 42, 44; foreign bodies in, 351
Thyroid (thī'roid) gland, 22, 115, 155 ff.; enlargement of, 131
Thyroxin, 22, 156
Tissue, kinds of, 17 ff.

Tobacco, a poison, 277 f.; the effect of, 278; as drug, 278 f.; and athletics, 279
Tone, muscular, 174
Tonsils, 39
Toothbrush, choice of, 95; care of, 96
Toxin-antitoxin, 288
Trachea (trā′kē ạ), 38, 44
Transfusion of blood, 27
Tuberculosis (tū bûr kū lō′sĭs), discovery of bacillus of, 288; inoculation against, 314; bovine, 432 f.

Ultra-violet ray, discovery of, 288
Underwear, 260 f.
United States Public Health Service, 400

Vacation, healthful place for, 232; physical examination before, 233; clothing for, 234
Vaccination (văk sĭ nā′shụn), Jenner's work on, 287
Vasomotor (văs ō mō′tẽr) nerves, 31
Vegetables, leafy, 139; raw, 139
Ventilation, artificial, 57; natural, 57 f.; of sick room, 322; of factories, 448
Ventricles (vĕn′trĭ k'lz), 27 ff.
Vertebræ (vûr′tē brē), 182 f.
Villi (vĭl′ī) of small intestine, 111
Vision, importance of good, 203 f.; defects of, 204 f., 209 ff.; effects of defective, 205; acuity of, 209 ff.; tests for acuity of, 213
Vitamins (vī′tạ mĭnz), 115, 131 ff.; relative amounts of, in foodstuffs, 136 f.
Vocal cords, 38

Wastes, removal of, 384 ff.
Water, as constituent of food, 129; pollution of, 386; importance of, 413; bacteriological analysis of, 416 f.
Water supply, in ancient times, 411 ff.; in country, 415 f.; survey of roadside, 417; guarding source of, 425; filtration of, 426 ff.
Weight, and height, 117 ff.; choosing diet to maintain standard, 127 f.; of child, 358
Windpipe, 38, 44
Women, employment of, 450
Wool for clothing, 258 f.
Work, and the healthy mind, 80 f.
Working conditions, 445 ff.
Working day, 448
Workmen's compensation laws, 458
Workshops, accident prevention in, 337
Worry, avoidance of, 79
Wounds, 342

Xerophthalmia (zē rŏf thăl′mĭ ạ), 132 f.
X ray, discovery of, 288
X-ray therapy (thĕr′ạ pĭ), 315

Yellow fever, discovery of cause of, 288; conquest of, 288